REVIEW OF THE STATE OF WORLD FISHERY RESOURCES

by

Marine Resources Service
Fishery Resources and Environment Division
Fisheries Department

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PREPARATION OF THIS DOCUMENT

This document, using statistics up to 1988 and including some information for 1989, is the biennial review of the state of the world fish stocks prepared by the Fishery Resources and Environment Division for presentation to FAO's Committee on Fisheries (COFI), and given wide circulation to interested institutions. It has been prepared on the basis of literature available throughout the world, but individual references are not given as the resulting bibliography would be very extensive.

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ABSTRACT

This paper updates the regular reviews of the state of the fish stocks, based mainly on statistics for 1988. The introduction refers to the increase in the world fish production, draws attention to major changes noted in specific fish stocks, and considers the status and problems facing the oceanic high sea resources. The rest of the document provides a review of the state of the stocks in the main FAO statistical marine and inland areas.

The FAO Fisheries Circular is a vehicle for distribution of short or ephemeral notes, lists, etc., including provisional versions of documents to be issued later in other series.

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A. INTRODUCTION

In 1970 the FAO Fisheries Department produced a review of the state of the world fishery resources (Gulland, 1970) at a time when estimates of the world fisheries' potential ranged from 55 to 2 000 million tons. The report intended to serve two purposes - first, to provide basic information on resources to indicate possibilities of development; second, to provide early warning of the need for conservation and management when catches approach the potential limit of the resources. It contained the best scientific evidence available at that time, and stressed that "too much attention should not be given to the precise value of many of the estimates".

The report clearly achieved its objectives; the drop in the rate of increase of total world landings has clearly shown the need for resource management while the estimate of overall world biological potential was set at about 100 million tons, a figure still largely valid today.

Since that time, the FAO Fisheries Department has been committed to promoting the management of fishery resources throughout the world through country, regional and international projects and meetings. A series of technical papers reviewing the resources of various fishery regions has been produced. This information, along with the most recent catch data, has been used to update a summary of the state of the world fishery resources for the Committee on Fisheries (COFI) as FAO Fisheries Circular 710.

The present document is the seventh revision of this Circular and its philosophy is similar to the original 1970 report. Fishery resources around the world are closer now to their maximum catch limits and many show signs of biological degradation and economic waste. Many of the recent global changes in landings appear to be more the result of climatic fluctuations on stock sizes than on fishery development or management processes. More is now known about the stability of fish species assemblages and their resilience to fishing, and despite the fact that not enough knowledge is available on coastal fisheries in many developing countries, it is clear that integrated management is urgently required if fisheries are to be rehabilitated or even sustained.

The frailty of the maximum sustainable yield (MSY) estimates and their variability should be remembered when reviewing this document. The tables containing MSY figures must be viewed with caution but are still useful as orders of magnitude of the size of the fisheries. As most fisheries are now fully fished, the average of the last 10 years' catch might, in many cases, provide a good estimate of MSY and its variance.

Recent Trends in World Fisheries Resources

The recorded landings of marine and freshwater fish were 98.3 million tons in 1988, an increase of 4.6 million tons over the catch in 1987 (see Table 1 and Figure 1). This is an overall continuation of the upward trend in total landings which started in the early 1980's and represents an average growth of around 3.8% per year since 1980.

The increase in total landings during the 1980's has not been equally shared between the fishing areas of the world (Figure 2). Most of the increase in marine landings (87.3%) has come from the Pacific Ocean and most of this from the Northwest Pacific (Area 61) and the Southeast Pacific (Area 87), both of which are areas of major current upwelling. Other areas with substantial increases in catch include the Northeast Pacific (Area 67), the Western Central Pacific (Area 71) and the Eastern Indian Ocean (Area 57). In the 1980's there has been little change in the reported landings in the Atlantic Ocean.

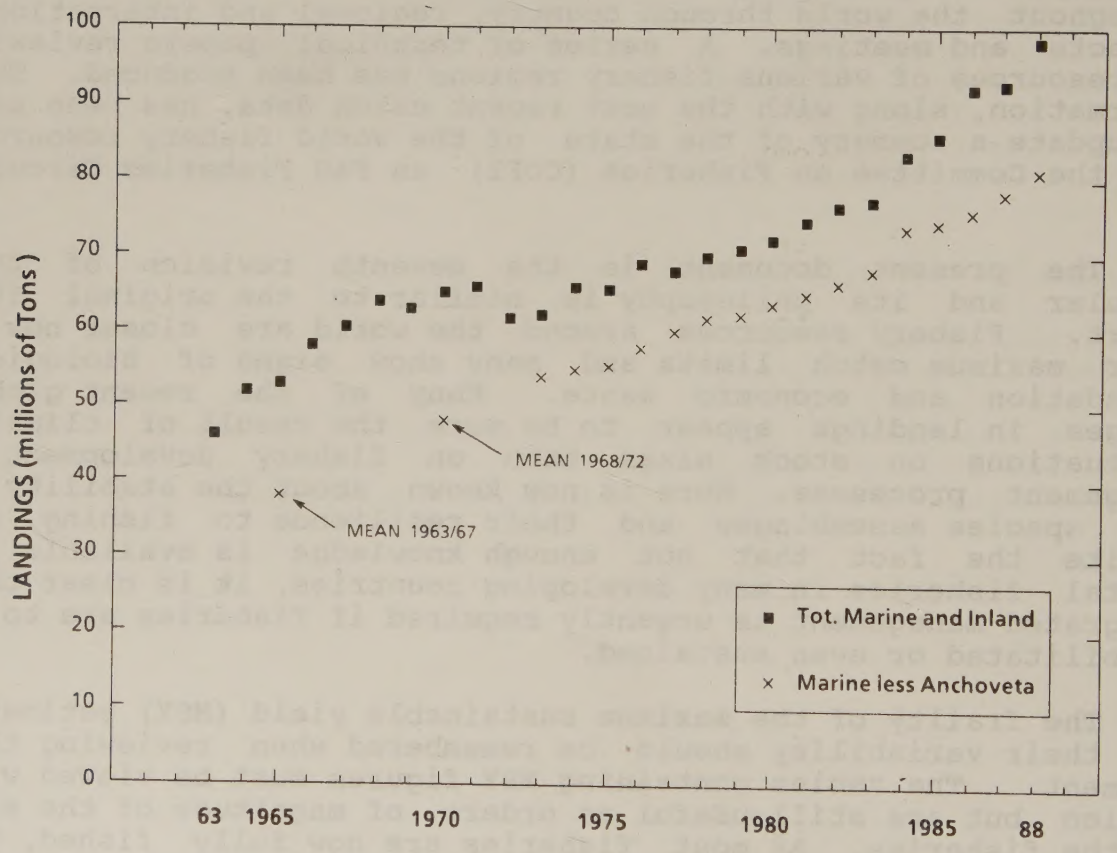

Figure 1 Annual world landings of aquatic resources (excluding mammals and plants)

Much of the increase in total landings during the 1980's can be accounted for by three pelagic species (Peruvian anchovy, South American sardine, and Japanese sardine) and the semi-demersal Alaska pollock from the North Pacific. Together, these four species account for 50% of the increase.

Reported world landings over the past 25 years appear to be in three stages (Fig. 1): an increasing trend in total catch through the 1960's, little or no increase through the 1970's, and a second period of increasing catch in the 1980's. The increasing trend during the 1960's can be primarily attributed to increased landings of both demersal and pelagic stocks through increased exploitation of existing fisheries, the discovery of new stocks and improved fishing technology. In the 1970's, following the collapse of the Peruvian anchovy stocks in 1970/71, there was very little increase in total landings. Most of the landings of the demersal fish stocks remained at the same level of catch, suggesting that they were generally fully exploited and the total landings of the pelagic stocks, although changing from one species to another in certain areas, did not change appreciably. In the 1980's, however, with most demersal stocks fully fished, shoaling pelagic species have provided most of the world's increased fish production.

Of the present world landings of 98.3 million tons, 84.9 million tons are reported to come from marine waters and of that amount, some 4.7 million tons were produced by mariculture. This leaves a total catch from marine waters of 80.2 million tons. In 1971, FAO made an estimate of a limit of 100 million tons from conventional resources in marine waters and this still seems a reasonable value. Projects for future expanded growth in marine waters would depend on the potential to produce more of the unconventional species (e.g., krill, cephalopods, or mesopelagic fish), but the economic viability of such fisheries is very doubtful at the moment.

The adoption of the Law of the Sea establishing Coastal State jurisdiction up to 200 miles continues to affect the catches reported by vessels fishing at long range. Table 2 records the trend for four selected areas and shows that while long-range catches in the Northwest Atlantic have declined from 52% in the early 1970s, they have appeared to stabilize over the past 8 years at 10-17%. Long-range catches in the Northeastern Pacific have declined from 79% in the early 1970's to 8% in 1988, illustrating the replacement of non-local fleets by national ones and joint ventures. Catches from long-range operations still remain a high proportion of the total in the Eastern Atlantic.

Status of High Seas Resources

High seas resources are considered as those resources which exist beyond 200 miles from shore, generally beyond national jurisdiction. The FAO data base lists close to 400 species that

can be considered as high seas or oceanic; about 50 species of cephalopods, 40 species of sharks, 60 species of marine mammals and 230 species of fish. The biological information available on these species is generally poor, except perhaps for some whales and large tunas, and their management and conservation is a matter of serious concern.

Most oceanic high seas resources are dispersed, difficult to harvest economically, and extremely difficult to study with any great degree of accuracy. They are usually exploited by long range fleets operating in areas where target species concentrate for feeding or reproduction. Average densities available in the high seas are much lower than in upwellings and coastal zones. The increasing scarcity of coastal resources to distant water fishing nations, due to overfishing and transfer of resources to coastal states jurisdiction, is an incentive to increase pressure on these areas and often fragile species.

Most baleen whales and the sperm whales are heavily overfished or depleted with some rare exceptions, and some species may even be beyond recovery. Future attention should be directed toward smaller cetaceans (toothed whales and dolphins) which are not properly protected and represent a potentially serious management problem.

Most tuna stocks in temperate or tropical waters are under heavy pressure and are intensively to fully fished locally. Further development is facing constraints with the emergence of the problem of accidental mortality of dolphins in purse seines and of various non-target species including mammals, birds and turtles in large-scale pelagic driftnets.

Management of salmon stocks on high seas needs strengthening in order to fully implement the relevant provisions of the Convention of the Law of the Sea.

Oceanic squids offer obvious potential for development on new species and areas while the main species already targetted are fully fished or overfished. With the present conflicts about driftnetting, possibilities to develop commercial fisheries are limited on oceanic dispersed species but are not inexistent. The oceanic sharks may offer more potential for concern than for sustainable development, and research on these species is badly needed as most fisheries have shown to be unsustainable. The oceanic horse mackerel appears heavily fished off Peru while its future is obscured by the lack of an international mechanism for its management, and cooperation in research, and coastal countries are presently expressing their concern.

In the Antarctic, depletion of commercial species of fish has followed depletion of marine mammals, and management performance could be improved. Krill is the exception, saved

probably by the difficulty to use it profitably. The concept of ecosystem management, particular to this area of the world, still has to be put into practice.

Demersal resources, extending on high seas shelves, are fully fished if not overfished. Progress in net-making technology will facilitate the intensification of the exploitation by island countries of non-conventional large pelagic species, such as dolphin fish, flying fish, as well as large tuna-like species, presently assumed underexploited with unknown potential. However, problems of accidental capture of low-resilience and ecologically sensitive species could emerge as in the large scale driftnet fisheries.

One of the main issues in high seas fisheries, as in any other fishery, is sustainability. This concept implies that resources can be reduced by fishing to some agreed average level, at which its existence (reproductive capacity) is not threatened. A particular problem concerns non-target species, sometimes fragile or already endangered, which could be inadvertently threatened by incidental capture while "optimizing" the use of a target species. It is impossible to extract living resources from the marine ecosystem without affecting it and there is some trade-off between the intensity of fishing allowed and the degree of resources allocation. The difficulty is that it is hard to forecast and attach a value to the potential damage to the pristine populations, resulting from planned development. Precautionary principles are beginning to be used, explicitly or implicitly. Although they could be useful especially in cases of high uncertainity, its use might need to be codified to avoid development paralysis.

The relative failure of international management to establish sustainable fisheries in many areas, despite the high quality of the research base sometimes provided, is clearly demonstrated by the dwindling resources, excessive catching capacity, uncontrolled transfers of fishing effort between resources and oceans, and depletion of many highly valuable resources, including those in the Antarctic, and for some whales. The fact that uncontrolled development of fishing effort leads to disaster has now been widely acknowledged in the scientific literature, and by high level fisheries management and development authorities. This is demonstrated by the discussion and agreements in two World Conferences on Management and Development of Fisheries held in Vancouver (1973) and Rome (1984). In practice, however, this verbal recognition does not always seem to translate into facts, and the future of high seas resources must therefore be considered carefully.

It is a source of concern that most high seas resources under international management suffer from excessive effort and depletion. Improvement of the state of resources has often not been obtained through traditional international fishery management but through either establishment of EEZs (although

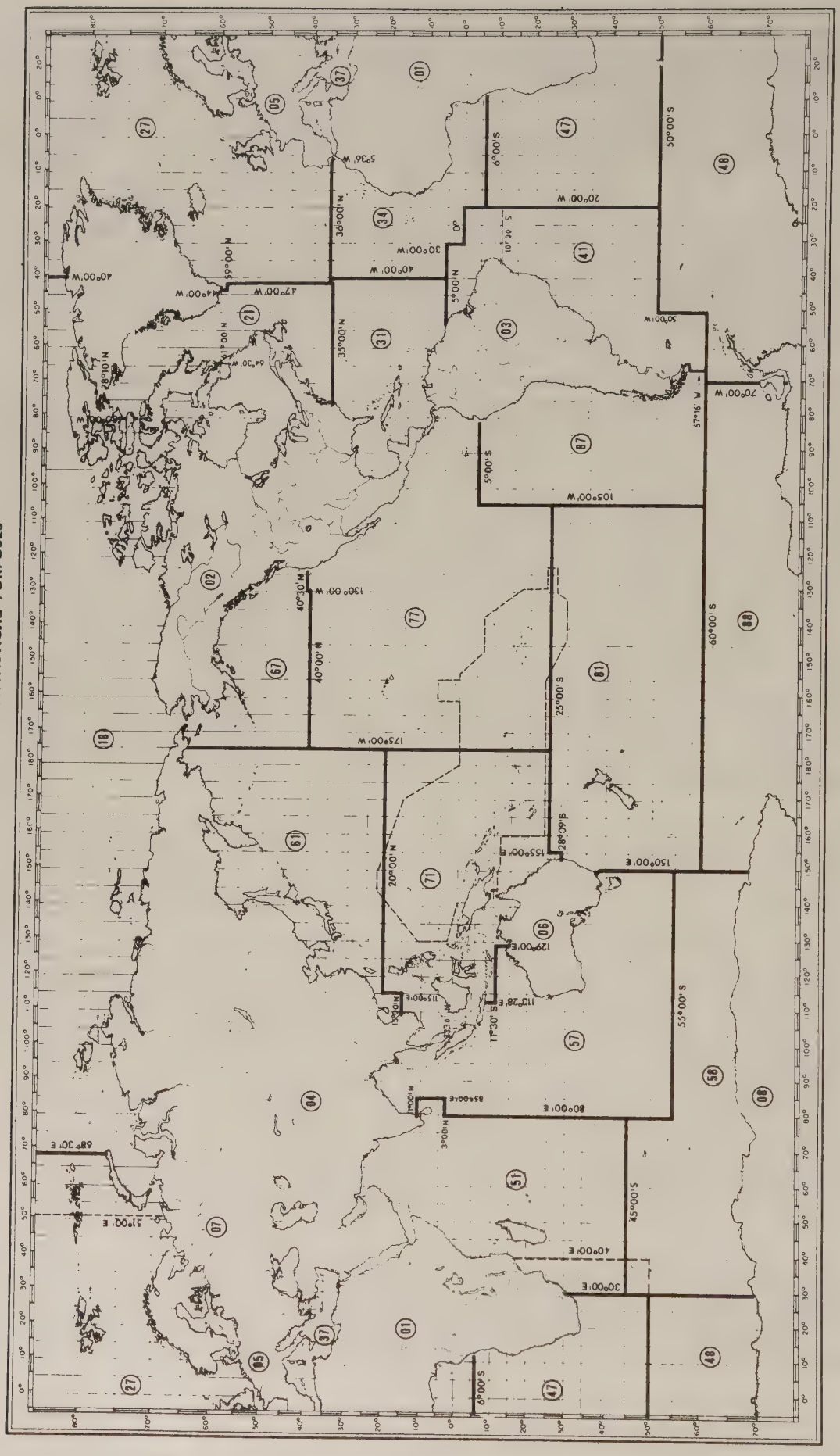

Figure 2 Geographic boundaries of the major fishing areas

many EEZ resources are also overfished) or through intervention of non-fishery users interests (e.g. whales, dolphins). UNCLOS seems to provide a broad, useful framework but it would appear that practices for responsible fishing need to be agreed upon, perhaps through the elaboration of a code of practice for the high seas, shared stocks, straddling stocks, some endangered species in the EEZs, etc.

B. REGIONAL REVIEWS

NORTHWEST ATLANTIC (Area 21) (Table 3)

(a) Northern Subareas

Total landings of finfish and invertebrates in 1988 were 3.0 million tons, similar to 1987, and up slightly from 1985 and 1986. This includes a small decrease in groundfish catches, and an insignificant increase in pelagic catches (3%). Considerable geographical variations continue to be the case, however, in the state of the resources, as well as the criteria used for management.

Cod fisheries in subareas 1-4 continue to experience the effects of a good 1984 year-class, with fisheries under quota control except in subarea 1; high but declining biomass on the Grand Bank, and severely depressed stocks on Flemish Cap. Some decline is noted from a formerly favourable situation for subarea 4 stocks, and heavy fishing and poor recruitment prevail for Gulf of Maine stocks.

Haddock stocks in subareas 3 and 4 are in a fragile condition, with heavy dependence on a few age groups and low or reduced catches have been recommended. The flatfish fisheries of these subareas have also recently shown either depressed or relatively stable stocks, although the Greenland halibut stock appears to be strong in the Gulf of St. Lawrence. The silver hake stock in subarea 4 has increased in abundance.

Although redfish are declining in subarea 1, possibly due to the by-catch of juveniles in the shrimp fishery, some redfish stocks in subareas 3 and 4 have shown good recruitment in recent years, and there are some relatively optimistic prospects for the 1990's.

Herring fisheries in subarea 4 continue to be strongly influenced by markets, especially for the roe, but generally, stocks are high or recovering. Some improved recruitment of capelin stocks is also evident, but difficulties continue in determining the true stock status.

A substantial clam resource, Spisula polynyma, has been located on the Scotian shelf, which together with ocean quahogs, appears to offer potential for a new fishery.

(b) Southern Subareas

Fisheries in the southern part of area 21 (subareas 5 and 6) have begun to show progressive symptoms of overfishing in recent years, especially by the trawl fishery. Landings of several high value species (cod, haddock and yellowtail flounder) are at or close to all-time low values. The other symptoms of overfishing are that landings have shifted to formerly lower value species, most of which are now close to fully exploited; including pollock, silver hake, other flounders, and for bivalves, ocean quahogs. Soft clams and hard clam landings are also depressed, and have been partly compensated for by increased landings of ocean quahogs. Only landings of scallops showed an increase. This was probably due to the impact of favourable environmental conditions during recruitment of currently exploited year classes; a situation that seems to occur at intervals of 8 to 10 years or so.

The abundance of Loligo squid in research vessel surveys was the lowest in the 1968-87 time series, but landings of Illex were up significantly in 1987.

Redfish in subarea 5 are now taken primarily as a by-catch of the mixed-species otter trawl fishery in the Gulf of Maine, and by 1987, stock biomass had declined by over 80% since the late 1960's.

By 1987, commercial CPUE indices and research vessel survey abundance indices of yellowtail flounder had also declined to record-low levels, and the fishery remains heavily dependent upon incoming year classes. Recent recruitment of yellowtail flounder stocks has been poor in subarea 5. Survey abundance indices for most of the "other flounder" stocks also exhibited declines in 1987.

The state of the stocks is less discouraging for several species of lower commercial interest. The exploitable biomass of pollock was expected to decline beginning in 1987, and landings in 1988 had declined from the record-high level in 1986 but still remain significant. Recruitment of silver hake in the last several years has been of average strength, but decreased fishing effort from distant-water fleets has helped to steadily increase stock biomass from the very low levels of the mid-1970's.

Up until 1987, Atlantic herring landings in the southern part of area 21 had remained fairly constant. Maine vessel landings increased slightly, and landings in the fixed gear fisheries remain at historically low levels. There is recent evidence, judging from research vessel survey results, of renewed spawning of the Georges Bank herring population, formerly believed close to extinction.

Total stock biomass of Atlantic mackerel was estimated to be about 1.6 million tons at the beginning of 1988. The 1981 and 1982 year classes were both strong and are still supporting the fishery.

The Coastal States in the Northwest Atlantic have sharply curtailed or eliminated distant-water effort in their exclusive economic zones. Management of shelf areas seaward of 200 miles has been conducted under the auspices of the Northwest Atlantic Fisheries Organization or NAFO, which has in many cases pursued a strategy for these stocks of harvesting at the $F_{0.1}$ level. The $F_{0.1}$ level is the effort level at which the increase in yield produced by one additional unit of effort is less than 1/10th of the rate of increase in yield obtained at very low levels of effort by applying one additional effort unit. Stocks considered to overlap Canada-Greenland boundaries and stocks exclusively fished by Canada and the EEC and which extend beyond the 200 mile limits into international waters, are assessed by the NAFO Scientific Council. The F0.1 criterion is still used in the Canadian zone and for some NAFO stocks, but has been essentially abandoned by the USA. Some member countries of NAFO are promoting the use of higher F levels, which places Canadian and some other management strategies in conflict and is also a source of contention within NAFO in that an objection has caused catch limitations to be disregarded by some members. Non-member fishing compounds this problem. The application of scientific advice to management of specific resources is, however, dealt with through bilateral or multilateral arrangements.

Difficulties have been experienced in collecting viable catch data, using conventional age-structured models for some stocks, and have prompted a revival of interest in the feasibility of using fishing effort data. These difficulties have included non-reporting by some member and non-member states, misreporting between areas, and have been made more serious by wide inter-annual variations in recruitment for many species such as haddock. These difficulties are directly relevant to quota management, and result from different possible strategies for stock exploitation or rebuilding. Experience in the southern subareas 5 and 6 suggest that in absence of quota control, catches are likely to decline, as was the case for haddock, hakes, redfish and yellowtail flounder. Catches of mackerel, Loligo squid, and shrimp are notable exceptions: the last two perhaps suggesting a warming trend in marine environments.

Long-term changes in production in the Northwest Atlantic, especially in the northern area of the region, show the influence of the physical environment, especially where a species is close to the extremes of its range. Warm/saline and cold/diluted periods in oceanic climate typically last for 3-5 years: a similar periodicity has been noted for northern cod stock recruitment, where the catches of cod in subarea 1 increased slightly in 1987 after years with a declining catch.

Notable over the last decade has been the general increase in landings of invertebrates; 33% of the catch in 1988, and a higher proportion of the total value. Noteworthy was the American lobster: this valuable species is subject to heavy pressure throughout its range, and it seems unlikely that present steady increases are due to improvements in management of the resources. Environmental considerations, in particular, previously-demonstrated effects of terrestrial runoff, plus changes in temperature, seem likely candidates.

Although winter temperatures were below normal, increased summer temperatures probably also partly account for increased shrimp landings in recent years, and may also have relevance for squids, clams, scallops and crabs; all of which showed increases in excess of 10%. Northern shrimp landings from subareas 0 and 1 have also increased significantly since 1984.

Tuna and billfish stocks in the region fall within the Terms of Reference of the International Commission for the Conservation of Atlantic Tunas (ICCAT) and total landings are listed in Table 19.

NORTHEAST ATLANTIC (Area 27) (Table 4)

Total reported catches in 1988 were 10.5 million tons, up slightly from 10.4 million tons in 1987. Of the 10.5 million tons, 9.7 million tons were finfish and 0.8 million tons were invertebrates. Most of the demersal stocks continued to exhibit downward trends due to excessive fishing pressure, undesirable fishing pattern (i.e. too much fishing on young fish) and poor recruitment probably related to reduced spawning stock biomass.

The level of exploitation of the North Sea cod, haddock and whiting stocks is very high. Most of the catch consists of fish which are 1 or 2 years old and fewer than one third of the fish alive at the start of the year survive to the end of the year. The fisheries are therefore very dependent upon newly recruited young fish.

The North Sea stock has been fished down to a very low level and survival is so low that recruitment is insufficient to maintain the stock in most years. Fishing mortalities must be reduced to give the stock a change to recover. The 1986, 87 and 88 year classes are all below average abundance. Spawning stock biomass has fallen to a record low level of 88 000 tons in 1988, the lowest acceptable level advised to be 150 000 tons. The immediate prospects for the haddock stock are also disturbing. The year classes of 1984, 85, 87 and 88 are all of below average abundance and that of 1986 was only average abundance. Spawning stock biomass has fallen to a record low level of 134 000 tons in 1988. Spawning stock and catches of North Sea whiting should increase in the coming years as a result of the abundant 1988 year class. Spawning stock biomass has stabilized at a level of about 250 000 tons from 1984 to 1988.

The situation is less clear with the North Sea saithe. There has been a declining trend in the spawning stock from 114 000 tons in 1985 to 86 000 tons in 1988, but now it seems to be recovering.

Total landings of Baltic cod have declined steadily from a high level of 441 000 tons in 1984 to 189 000 tons in 1988, the lowest level since 1971. A decreasing trend in spawning stock biomass has been observed since 1984.

Landings of North East Arctic cod were on an average about 700 000 tons in the 1970's with peak landing of 1.1 million tons in 1974. Landings were also above 1 million tons in 1968 and 1969. The landings in 1987 and 1988 were 523 and 432 thousand tons respectively. Spawning stock biomass has been stable since 1978 but at 30 percent of the 1970 level.

The catches of North Sea sole decreased substantially in 1986, 87 and 88, whereas catches of North Sea plaice have stabilized. Spawning stock biomass of sole is at a historic low level (32 000 tons in 1988 compared to 44 000 tons in 1984), but the 1987 year class is exceptionally strong.

Spawning stock biomass of plaice has remained at a stable level of about 360 000 tons, above the lowest acceptable level of 300 000 tons.

The stocks of mackerel in the North Sea and west of the British Isles have been declining since 1973-74. The spawning stock biomass of North Sea mackerel is at its historic lowest level and is only a small percentage of the stock size in the 1960's. The western spawning stock biomass has dropped from 2.3 million tons in 1983 to 1.8 million tons in 1988. More than half of the present stock is composed of the 1987 and 1984 year classes. There is high misreporting of catches from this stock. Considerable quantities have been reported as horse mackerel, and discarding of young specimens is known to take place, but the quantity is not recorded.

The industrial fishery in the North Sea is targetted on small species like sandeel, Norway pout, and sprat for fish meal production. The total landings were around 1.8 million tons in the mid-1970's, 1.5 million tons in 1980, and 1.3 million tons in 1988. Sandeel is by far the most important catch and constituted more than 60% of the total catch in 1988 (893 000 tons), the highest on record.

The Barents Sea capelin stock is completely depleted. This rapid and massive reduction appears to have been caused by ecological factors (e.g cod predation) and not by fishing alone. The Iceland/East Greenland stock appears in a better condition, but the state of the stock is highly variable due to the short life span of the species.

In contrast to the declining trends for most demersal and many of the pelagic stocks, several of the major herring stocks in Area 27 have experienced noticeable recoveries in recent years from states of virtual collapse in the 1970's brought about by excess fishing pressure and subsequent poor recruitment. Closures or severe restrictions on fishing resulted in the gradual rebuilding of these stocks, and with the production of some very strong year classes in the 1980's, fishing has again been resumed. The North Sea stock is still increasing from a low in 1978 due to a very strong 1985 year class coupled with other good year classes. The catch in 1988 was over 750 000 tons. The Icelandic summer-spawning stock supported fairly stable annual catches of about 50 000 tons from 1979-85 which increased to 93 000 tons in 1988. Spawning stock biomass was about 440 000 tons in 1988, the highest level seen since 1947.

The Norwegian spring-spawning stock, once the largest herring stocks in the world with a spawning biomass of 10 million tons in 1957, has been slowly recovering from virtually zero in 1972 to about 1.3 million tons in 1988, with a recent surge due to a very strong 1983 year class. Landings in 1988 were about 165 000 tons compared to 10 000-20 000 tons during 1972-83.

Other smaller herring stocks which have increased or are still increasing in size, include that in the Skagerrak-Kattegat and Western Baltic area, several in the area west of Scotland and Ireland, and several in other parts of the Baltic.

Catches and exploitation levels in the traditional redfish fisheries around Iceland, East Greenland and Faroe Islands are at a fairly low level, with some uncertainty as to stock levels. A new fishery began in 1982 on an oceanic stock of Sebastes mentella, in international waters between Greenland, Iceland and the Atlantic Ocean north of the Azores. Catches rose from 60 000 tons in 1982-83 to 105 000 tons in 1986 but declined to 91 000 tons in both 1987 and 1988.

Hake landings have remained fairly stable over the past six years. The stock status is uncertain, but there is clearly a high fishing mortality on young fish, the catches of which are generally discarded. Landings of sardine decreased from a stable level of about 200 000 tons in 1980-85 to 160 000 tons in 1988. Catches of European anchovy have dropped from a level of about 60 000 tons in 1960s to 15 000 tons in 1988.

Landings of the northern blue whiting dropped from 1.1 million tons in 1979-80 to 523 000 tons in 1988. The spawning stock was at an historic high of 6.3 million tons in 1976-77, declined to a minimum of 2.5 million tons in 1984, and increased to 4.4 million tons in 1988. Several weak year classes suggest it is declining again.

Horse mackerel landings have increased in recent years with 356 000 tons reported in 1988. The stocks are supported by a strong 1982 year class but unless other strong year classes appear, the resource will be unable to support continued landings at the present level.

The scientific advice on which management measures are based (e.g. total allowable catches (TAC), minimum mesh sizes, etc.) is provided by the International Council for the Exploration of the Sea (ICES) through its Advisory Committee on Fisheries Management (ACFM).

Advice relative to the management of Atlantic salmon throughout the North Atlantic (exclusive of the Baltic) has been provided by ICES to the North Atlantic Salmon Conservation Organization (NASCO) since 1984.

As a general rule, the agreed TACs throughout Area 27 have exceeded the TACs recommended by ICES, and actual catches have exceeded the agreed TACs. Enforcement of management measures has not been adequate in all areas and many problems arise from the fact that many of the regulated stocks are harvested in mixed fisheries. The reliability of reported landings statistics has deteriorated for some stocks as a result of management/ enforcement problems which, in turn, has reduced the reliability of the scientific advice on those stocks. ICES has recognized the need for multispecies assessments and advice, taking into account both the biological relationships among species and the technical interactions in mixed-species fisheries, and has been actively involved in the relevant research and development of methodologies.

WESTERN CENTRAL ATLANTIC (Area 31) (Table 5)

Reported landings from the commercial fisheries in this region have declined slightly over the past year to 1.9 million tons. Gulf menhaden continues to be the major species caught in terms of weight, and landings have declined significantly in 1988 (639 000 tons) compared to the record catch of 983 000 tons in 1984. This is in line with predictions of USA biologists who had stated that the fishery would not sustain former levels of harvest.

Many of the demersal resources of island shelves in the region are already fully or overexploited. Landing figures for demersals must be qualified because they do not include the catch by sports fishermen, or the quantities discarded at sea by commercial shrimp trawlers which can be very significant. Along the U.S. Gulf and South Atlantic coasts, the catches of preferred species by sports fishermen generally exceed the commercial catches. In fact, the growing economic importance of sports fishing has seen progressive restrictions being introduced in some areas on the activities of the commercial fishery. Concern has increased in recent years over the effect that the intense

trawl fishery for shrimp in the northern Gulf of Mexico has had on species taken incidentally to the catch; notably marine turtles and, primarily in the United States, the juvenile stages of fish of interest to the important sports fish lobby. Turtle Excluder Devices have been legislated for use in some areas, and interest is centred on more selective ways of harvesting shrimp.

Discards by shrimp trawlers continue to be significant, though variable, for different shrimp fisheries in the area. These reduce the possibilities for further expansion of bottomfish catches, for which a considerable potential undoubtedly exists. Given that valuable shrimp fisheries continue to receive priority, the more effective use of by-catch is an obvious way of increasing yields. Increased landings have been registered for sharks and rays, but groundfish stocks on the outer shelf and slope have remained relatively untouched throughout Area 31.

The catches of snapper/grouper species have remained at roughly the same level over the past decade, though catches of grunts have declined. New information on the relatively slow growth rate of deep-water snappers and groupers tend to reduce our perception of the potential yield from these resources.

The greatest potential for any further expansion of fisheries in the region will come from the smaller pelagic fish, the largest migratory oceanic pelagics, as well as possibly for cephalopods and other less familiar types of fish. Some of the species of high interest are tunas (especially skipjack, yellowfin, blackfin and bonito), the wahoo and dolphin fish. Distant-water fisheries for large pelagics have expanded within the region in recent years; that for tunas by Venezuela, and swordfish by U.S. vessels, being especially notable. Since many of these species are migratory over considerable distances, their utilization and rational management will require close collaboration between the countries of the region.

At least two dolphin fish stocks are believed to occur in the eastern Caribbean, southeast and northeast of the Virgin Islands. These fish are caught by a number of eastern Caribbean countries, and there is a need for cooperative research and management. A meeting was held on shared fishery resources of the Lesser Antilles region (FAO Fish.Rep.383) in 1986 with the objective of mapping the extent to which the major fishery resources may be shared, to determine what information is needed to better assess the problem, and how to go about acquiring and analyzing the information. The general conclusion was that for the Lesser Antilles region, a degree of resource-sharing is evident, even for shelf resources, which requires a subregional management framework. A cooperative fisheries approach for the subregion is now in an early stage of implementation (FAO Tech.Pap.313). The problems of cooperative management of migratory stocks of the flying fish are also becoming apparent between several island countries.

The queen conch and lobster resources are heavily exploited in most regions of the Caribbean, and attempts have been in a number of countries to institute management plans, or even in the case of conch, to attempt stock rehabilitation. Success to date has been limited with this latter type of initiative.

Octopus fisheries now occur in a limited number of locations most notably on Campeche Bank (Mexico), in Cuba, and in Venezuela; this despite a much wider distribution and growing market which could lead to a significantly expanded fishery. The potential for squid fisheries in the eastern Caribbean is almost undeveloped, and deserves investigation, for both human consumption and as a bait for large pelagic and sport fisheries. Earlier scallop fisheries which show a very irregular production pattern, showed a peak in 1988, and crab landings have gradually increased over the last few years.

Shrimp landings have changed very little over the past decade, varying between 150 000 and 200 000 tons. Considerable attention has recently been focussed (e.g., Mexico, U.S.A., Venezuela, Guyana) on improving management of these key resources, using economic as well as biological criteria. Cooperation in management of common shrimp resources takes place between the U.S.A. and Mexico in the Gulf of Mexico, and the first steps in this direction have been made in the Guyanas-Brazil region. Licence limitation is now becoming a reality in some shrimp fisheries; thus, Brazil has recently placed a limit of 250 vessels for fishing the shrimp stocks of northern Brazilian waters. There is also a closed season of 60 days to protect shrimp recruitment in the area and closed areas are now in effect in some U.S. waters. Some countries of the region have moved to full-scale shrimp aquaculture, using wild fry. This has led to concern with the destruction of shrimp nursery habitat (mangroves and coastal marshes) as a result of pond construction. There is also a problem in some areas with the effects of runoff of agricultural chemicals onto shrimp nursery areas.

The scattered nature of the fisheries, other than those for menhaden and shrimp, and the deficiencies in much of the basic statistical data continue to make fish stock assessment difficult in the region.

Investigations on the marine resources of the area fall within the terms of reference of the Western Central Atlantic Fisheries Commission (WECAFC), except for tunas which are covered by the International Commission for the Conservation of Atlantic Tunas (ICCAT). The WECAFC Commission and its two working parties (on marine resources and statistics) meet in alternate years, as does its Committee for the Development and Management of Fisheries in the Lesser Antilles.

EASTERN CENTRAL ATLANTIC (Area 34) (Table 6)

Some of the world's most important fisheries are found in the Eastern Central Atlantic area. Catches in this region rose to a maximum of 3.8 million tons in 1977, falling subsequently to 2.9-3.0 million tons in 1985-1986. The total regional catch is now back to 3.6 million tons illustrating the large fluctuations of the small pelagic resources such as horse mackerel and sardine under climatic and fishing pressure which are characteristic of this region.

Catches were obtained by 21 coastal countries and more than 18 non-coastal countries, giving a markedly international character to many of the region's fisheries. The share of landings by non-African long-range fleets remains high in this area. It has decreased from 68% of the catch in 1977 to 59% in 1979, 57% in 1982 and 45% in 1986. This share is back to 56% in 1988, reflecting partly the difficulty of African countries in fully exploiting the resources themselves, and partly the large fluctuations of pelagic offshore resources which foreign fleets exploit.

Northern Sector

In the northern sector from Cap Spartel (Gibraltar Strait) to the north of Cape Timiris (Mauritania), the demersal stocks are almost fully exploited or overexploited, both economically and biologically. These include cephalopods, hakes, sparids; the one possible exception being the stock of black (Senegalese) hake found to the south of Cape Juby. To adjust to the Maximum Sustainable Yield level, the fishing effort would have to be significantly reduced for cephalopods and European hake which also needs adequate protection of small size fish. Recent management measures taken in Morocco (closed seasons) have proved to be beneficial.

The coastal stocks of seabreams are heavily exploited to the north of Cape Juby and markedly overexploited to the south of Cape Bojador. The recovery of the stock is threatened by the rapid expansion of the cephalopod fishery, which is incidentally producing a high fishing mortality on juvenile seabreams.

The large stock of Moroccan sardine seems to have returned to historical levels with improved accessibility by coastal fleets in the north of Morocco.

In the Mauritania-Senegal sector the fishery has undergone major developments in the last ten years, due to increases in fishing by foreign fleets and development of national fishing capacity. Catches have not increased, and all the stocks traditionally exploited are considered at least fully fished. The levels of abundance of demersal stocks have been seriously reduced since the early seventies and the future of the resources is a matter of concern.

Shrimp stocks of Senegal are fully exploited and the overall potential seems to have increased significantly compared to earlier studies. This, and the fact that the abundance of octopus has also increased while traditional species abundance has decreased, could be taken as an element showing that the ecosystem is under severe fishing pressure.

The large stocks of sardine, mackerel and horse mackerels of that region are highly variable, and their assessment is difficult. They are periodically subjected to high variations in abundance due to climatic changes, or to large increases in fishing effort, or both. Because foreign fleets tend to shift from one species to another, CPUE's are difficult to interpret. The stock of mackerel seems to be fully fished. In addition, the stock of sardine north of Cape Blanc has apparently experienced a period of increased abundance leading to unusually large catches, especially by foreign fleets.

The state of the deep sea resources on the slope is unknown. Fishing is intensive on shrimps, hakes and seabreams, either directly or through "incidental" mortality resulting from by-catch in the horse mackerel fishery. Research effort is insufficient and recent attempts to assess the resources were unsuccessful.

Southern Sector

In Guinea, recent trawl surveys have shown that coastal resources inside 15 m depth were largely untouched, offering a significant potential of 15 000 tons for artisanal fisheries development. The traditional offshore stocks have been severely fished by foreign fleets for years and their status is unknown.

In the Sherbo area (Sierra Leone and Liberia) the state of the stocks is not well known. They have been heavily fished by foreign fleets in recent years, but biological data and statistics are still inadequate for a detailed scientific analysis. From data collected by an acoustic survey in the Sherbro area, it appears that the large stock of Balistes which developed in the seventies has practically disappeared, possibly because of fishing pressure, but more likely due to a reversal of the change in the climatic conditions.

Throughout the sector, the most commonly captured fish species in depths less than 50 m seem to be fished at about the level of maximum explcitation. Demersal stocks, further offshore from 50 m to 200 m, are still not fully exploited. However, it is unlikely that their exploitation rate will increase because the fishery is not economically attractive due to the lower density of fish and catch rates, and higher fishing costs.

The pink shrimp (Penaeus notialis) present in small concentrations from Senegal to the Congo, seems to be exploited at the level of maximum biological production. Competition

exists between artisanal inshore and industrial offshore fisheries. As catch rates increase, shrimpers are keeping larger amounts of fish by-catch for marketing, and better use is being made of fish which used to be discarded.

The important stock of Sardinella aurita of the Cote d'Ivoire-Ghana-Togo-Benin area, which had collapsed in the past due to both high fishing pressure and bad climatic conditions, returned to record and steady high levels since the beginning of the mid-eighties with landings of 60 000 to 130 000 tons/year.

The stock of Sardinella maderensis in the same area seems to be in good health, while very little is known about the stocks of anchovy and mackerel.

There is a general lack of data on resources in the whole southern Gulf of Guinea, where many countries have not yet developed the appropriate data base and research structure. The demersal stocks of the deep shelf and slope, especially on hard bottoms, seem to be still underfished in most of the southern Gulf of Guinea. They may offer some potential for modern artisanal fishing with gillnets or longlines.

Significant progress has been achieved in Cameroon where research programmes have demonstrated that coastal resources were supporting very high levels of fishing mortality, particularly in the estuary where small trawlers operate part of the year. There appears to be a need to increase mesh size and possibly to reduce fishing effort.

The assessment and elaboration of biological advice for management of the resources in this region are undertaken traditionally in the framework of the Committee for the Eastern Central Atlantic Fisheries (CECAF) by the national research laboratories' bilateral assistance programmes, and the FAO regional projects dealing with fisheries management. During the last biennium, important initiatives have been taken at sub-region level by the coastal countries to promote collaborative assessments on shared stocks through working groups and it is the objective of CECAF to promote and support these initiatives as far as possible.

With a few exceptions, most stocks extend beyond the coastal countries' national boundaries, occasionally shared, as in the case of horse mackerel, by as many as 7 countries. This characteristic compounds the difficulties of stock assessment and the subsequent adoption and implementation of the management measures necessary for a rational use of the resources.

The CECAF Sub-Committee on Management recently went through a process of overall review of all stocks in the area and the overall conclusions are: (a) most large stocks are fully fished or overfished; (b) pelagic stocks are highly variable and

difficult to evaluate. Their management must be flexible and take this instability into account; (c) the rate of updating of the evaluations is not satisfactory.

The frequency of the assessment working groups has decreased considerably during the past few years, because of the termination of the Regional FAO/CECAF Project and insufficient development of research at national level in many countries, even though the willingness to increase collaboration between coastal countries in the northern CECAF area is very encouraging.

With 21 coastal countries and 43 stocks and groups of stocks of importance, there are about 800 stock elements to be evaluated regularly in the whole CECAF area. The data available since 1980 show that the CECAF project and the countries together produce new information (often still insufficient) on 20 stocks on the average, i.e., 2.5% of the number of available stocks. Because these updatings are largely concentrated on the northern CECAF area, the shortage of information in the rest of the region is clearly evident.

MEDITERRANEAN AND BLACK SEA (Area 37) (Table 7)

Total landings in 1988 were 2.0 million tons which is similar to the record catch reported in 1986. The landings are up considerably from the 1.1 million tons reported in 1973 but the increases have levelled off from 1982 through 1988 with a range over these seven years of 1.88 to 2.02 million tons.

Overall landings rose in the Black Sea over the last two decades, almost entirely due to small pelagics (especially anchovy) landings, but there has been a significant decline in diversity. Preliminary evidence suggests that in addition to earlier declines in demersals and migratory pelagic fish, a serious decline in the main anchovy stocks occurred beginning 1988-89.

Evidence for widespread impacts of nutrient run-off from terrestrial sources on marine fisheries of enclosed seas has become more explicit in recent years; especially in the case of the Black Sea, the Adriatic, and other littoral areas of the Mediterranean basin, such as the northern Aegean, the Gulf of Lions and the Gulf of Gabes. Taken together, these areas showed some increases in combined official landings from the Mediterranean over the 10 years preceeding 1987, especially for small pelagic fish, which have been most notable in the above mentioned areas affected by coastal eutrophication. This suggests that despite levels of fishing effort that are believed to be at or above those necessary to produce MSY, increases in biological production have been occurring. Eutrophication has progressively become a problem for other areas, especially for the Adriatic, where anoxic episodes caused by phytoplankton blooms, including red tides, have led to local summer fish kills and episodes of shellfish contamination by toxic micro-organisms

and human waste discharges. A general worsening of the marine environment of the Black Sea has occurred, where especially demersal, and benthic resources, and migratory fish species, appear to have been seriously affected by a combination of heavy fishing and environmental changes over recent years. There also appears to be evidence for recent serious changes in species dominance in the pelagic ecosystem.

In the western Mediterranean, stocks are heavily exploited, with the possible exception of mackerel and horse-mackerel, while in the Adriatic and Gulf of Lions there is evidence of overfishing of most of the highly valued demersal species such as hake and red mullet. In the central Mediterranean, the demersal resources generally are fully exploited to heavily overexploited: off Italy demersal stocks are very heavily fished, and fish density there is about one-fifth that of Tunisian waters. Despite this, landings of demersal species for the whole continental shelf of the Mediterranean increased for most species by some 3-8% per year between 1975-76 and 1985-86. Overall reported landings of Mullus spp. and Merluccius both rose by 5-7% per year, and similar rises were reported for prawns and shrimps. Landing trends for Pagellus spp. and the general category of cephalopods were more modest, at 3-5% per year. A few species, such as Maena spp. registered small overall declines. More recent information suggests a stabilization of densities in other key stocks. In inshore Spanish waters, an increase in the proportion of octopus in the catch has been suggested as a response to declining bottom-fish stocks.

It may be possible to explain some of this earlier increase as a result of the higher fishing effort exerted, and/or improvement of the statistical data base, but as noted above, other factors such as an increase in productivity of previously nutrient-limited coastal waters cannot be excluded.

Past heavy fishing effort in Cyprus has reduced catches of formerly abundant species, and led to a fishery dependent on smaller species. In response to this situation, typical of a number of Mediterranean fisheries, the trawl fishing season in Cyprus was closed for a period of time in order to protect the young fish stocks. This measure roughly doubled the fish landings, and increased profitability for artisanal and trawl fisheries. It also led to dramatic rises in fishing effort by both trawl and artisanal fleets, with the result that increased profits for individual fishermen are still not being generated by the fishery. As a conclusion that might be applied to Mediterranean fisheries as a whole, fisheries economists have recommended that in the event of increases in catches due to improved management, dissipation of the resultant profits by investment in excess vessels could be avoided by licence limitation of both artisanal and industrial fleets.

Italy has recently introduced the use of seasonal closures to protect their young fish stocks, and this appears to have been

effective in the Adriatic in increasing recruitment of red mullet. Separate fishing areas in Israel are now allocated for different types of gear in order to reduce conflict between trawlers and other gears.

Coordinated management of shared resources remains a problem for most Mediterranean fisheries. The degree of mixing between, for example, Spanish and North African stocks in the Sea of Alboran, or Italian and Yugoslavian demersal and pelagic resources, and the consequent need for coordinated development and management programmes, is being assessed at a sub-regional level. The realization that a common resource in the Gulf of Lions is now being fished outside the national waters of Spain and France, led to ad hoc GFCM meetings in which a management and statistical framework was set up. Bilateral consultation on a regular basis continues, with the objective of eventually moving to a special management regime for the area with a common framework for statistical exchange and fleet licensing. This has been followed by similar meetings on the Sea of Alboran pelagics, notably sardine, which appears to constitute a common stock.

The small mesh size used in trawling in many countries continues to be a problem, and the need to enforce the 40 mm mesh size regulation has been generally supported by the Adriatic and Western Mediterranean Consultations. At the same time, this measure appears to be no substitute for protection of sensitive nursery areas, e.g. of Zostera marina (eel grass) beds from the effects of trawling, and the general priority remains with control of excessive fishing effort, pollution, and degradation of the coastal zone.

A high degree of fluctuation in stock size characterizes the small pelagic stocks of the Mediterranean, being well documented in the fisheries in the Sea of Alboran and the Adriatic. Sardine stock size for several areas has been shown to be influenced by primary production; itself responding to levels of nutrient runoff, which have been generally increasing in coastal waters.

The sardine stock appears to be rather underexploited in the northwestern Mediterranean, judging from hydroacoustic suveys, although growing use of high opening trawls in some countries has increased utilization of small pelagics, while maintaining pressure on demersal stocks. The sardine stock in Morocco appears to be fully exploited, and has declined recently relative to anchovy. Small pelagic stocks in Algeria appear to be underfished at present, especially for anchovy, and Mediterranean stocks of horse-mackerel, in general, appear underexploited. Small pelagics landings have been variable, but there has been an overall increase of roughly 4% per year for all small pelagics combined over the last decade up until 1985-86.

Increased interest in large pelagic resources in the Mediterranean has led to heavy pressure on the bluefin tuna and swordfish resources, using fishing techniques such as large-scale

surface driftnets; this is of special concern in the vicinity of straits and along migration routes. Many local swordfish stocks in the Mediterranean appear to now be operating on very young, small fish, implying local overfishing.

Bonito, Sarda sarda, and swordfish, Xiphias gladius have shown landing increases averaging over 8-10% per year over the period 1975-85 - figures almost equalled by bluefin tuna. Local increases in fishing effort, or new or expanded fisheries, such as those for swordfish in Greece, Malta, and the Ionian Sea, appear to account for increased landings, not increases in abundance. The need is apparent for some coordination of research and statistics gathering. This is true not only for swordfish but also for bluefin tuna: a species considered by ICCAT as in serious need of conservation measures. Possible problems with other highly migratory species may be indicated by the decline in landings of Pomatomus, and by the effective termination of mass migrations of bluefish, bonito and mackerel into the Black Sea since the 1970's.

GFCM, in cooperation with ICCAT, held a joint meeting in 1990 to tackle management problems of the highly migratory fish in the Mediterranean.

The complex of problems faced in many Mediterranean countries with fishery management, are most clearly focussed on the coastal zone, where critical habitats for fisheries (nursery areas, sites for aquaculture development), often encountered uncontrolled expansion in the use of the same areas for other human activitities, such as tourism, domestic waste disposal and runoff of chemicals from industry and agriculture.

Advice and recommendations for the management of the resources of this area are elaborated through the General Fisheries Council for the Mediterranean (GFCM) and the Joint Commission on the Fisheries of the Black Sea. Since 1980 the evaluations of the resources have been updated as regularly as possible within the framework of GFCM in a series of technical consultations held regularly in the Western and Central Mediterranean area, the Adriatic Sea and the Eastern Mediterranean.

SOUTHWEST ATLANTIC (Area 41) (Table 8)

Total catches in this area continued to increase, although at a slower rate than in previous years, from 1.6 million tons in 1985 to 2.1 million tons in 1987 and 2.2 million tons in 1988. Most of this change is due to increased catches of squids, hakes, and other demersal stocks in the Patagonian Shelf and Slope area.

One of the most important fisheries is that for hake. After being stable at about 350 000 t for several years, catches of hake dropped to 260 000 t in 1984, increased to 370 000 t in 1985 and 1986, and 430 000 t in 1987 and 1988. Two species of hake

are reported in the commercial catches in this area: the common hake (Merluccius hubbsi) which is the most abundant and is found mainly in the northern Patagonian shelf off Argentina and the continental shelf off Uruguay and southern Brazil, and the Patagonian hake (M. polylepis) which is found farther offshore in the southern Patagonian Shelf, around the Falkland (Malvinas) Islands and along the Patagonian Slope.

Although the common hake has a more coastal and northern distribution, it may be caught together with the Patagonian hake, particularly offshore where the areas of distribution of the two species overlap. It is usually difficult to distinguish these two species in the commercial catches.

Hake in this area used to be exploited almost entirely by Argentinian and Uruguayan fleets operating in the northern Patagonian Shelf area, and in the Argentinian/Uruguayan Common Fishing Zone, and to a lesser extent, by a small Brazilian fleet fishing in southern Brazil. In recent years, the catches of hake by long-range foreign fishing fleets operating offshore has been increasing. In 1985, around 98% of the reported catches of hake in this area were caught by fleets of the three coastal countries mentioned above, while in 1988 they reported only 56% of the total catches. The remaining 44% was caught by long-range fleets, mainly from Spain, Japan, Portugal and USSR. Most of the offshore catches by the long-range fleets is suspected to be Patagonian hake. It is likely that these two species are fully to heavily exploited.

No major changes were noted in the catches of croakers and weakfishes. Most of these stocks are moderately to fully exploited. The stocks of weakfish in the Argentinian and Uruguayan Common Fishing Zone are stable, after having recovered during the early 1980's. Some limited possibility for further expansion of this fishery exists in northern Brazil.

Catches of sardinella (Sardinella brasiliensis), taken exclusively by Brazil, dropped to 92 000 t in 1987, and 65 000 t in 1988, after being relatively stable at a level of more than 100 000 t per year for several years. This stock was considered to be fully exploited, and the drop in total landings may be due to a combination of heavy fishing and biomass fluctuations due to natural causes. Other clupeoids and other small pelagics are lightly fished in this area. The stock of anchoita (Engraulis anchoita) off Uruguay, northern Argentina and southern Brazil is virtually unexploited, with an estimated potential of a few 100 thousand to 1 millon tons per year. Total catches of this species in 1987 and 1988 were around 20 000 t, mostly reported by Argentina.

Major changes continued to occur in the stock of shrimp (Pleoticus muelleri) in the central part of the Patagonian Shelf area. After increasing from 2 600 t in 1981 to 23 000 t in 1984, catches dropped to 10 000 t in 1985, 7 000 t in 1986, and 2 500 t

in 1987, causing serious concern to the Argentinian fisheries sectors fishing this stock. Total catches of this species increased to almost 18 000 t in 1988. The wide fluctuations in the total catches of this species is almost certainly associated with year-to-year changes in the overall abundance of the stock, which might be affected by heavy fishing, but is also strongly influenced by environmental changes.

Catches of squids in this area continued to increase from 31 000 t in 1980 to more than 350 000 t in 1986, 740 000 t in 1987, and 690 000 t in 1988. Most of these are short-fin squids (Illex spp.) and common squid (Loligo spp.) caught in the southern Patagonian Shelf and slope area by long-range fleets from Japan, Korea Republic, USSR, Poland and Spain. After a period of great uncertainty regarding the state of these stocks, and the fear of overexploitation, some management measures were introduced to reduce the fishing effort in some of the main fishing grounds. This helped to keep fishing effort within reasonable levels in the areas under control, but fishing in other areas increased over the last two years. The overall abundance of this stock is reported to vary widely from year to year due to natural causes, and close monitoring is needed for adequate protection. These stocks are considered to be fully to heavily exploited in the Patagonian Shelf and Slope area, and lightly exploited elsewhere, particularly in the coastal areas further north.

The other main fisheries in the Patagonian Shelf and Slope area is for southern blue whiting (Micromesistius australis), mostly caught by USSR and Polish fleets. Catches of this species have been more or less stable at around 100 000 t per year since 1984, and the stock is considered to be lightly to moderately exploited.

Other demersal fish stocks in the Patagonian Shelf area include the grenadiers (Macrourus spp.), tadpole mora (Salilota australis), pink cusk eel (Genypterus blacodes), toothfish (Dissostichus eleginoides), sharks, rays and notothenids. Total catches of these species continued to increase steadily to 131 000 t in 1988. Although there is little specific information, most of these stocks are considered to be moderately exploited.

An issue of serious concern for the conservation and long-term management of the fish stocks in this area was the rapid development of the offshore fishing in the Patagonian Shelf and slope area by long-range fleets. In this area, some important fish stocks are being exploited both within the 200 nautical mile limit where national jurisdiction can be exerted, and in the area beyond where no national jurisdiction is recognized. Some management measures have been adopted to regulate fishing effort in some of the fishing grounds, although fishing on the high seas still remains unrestricted. After the re-establishment of diplomatic relationships between Argentina

and the U.K., the two countries are reportedly considering alternatives for further cooperation aiming at improving the research, monitoring and control of fishing in the area.

Argentina and Uruguay continue to maintain close cooperation within the framework of the Joint Technical Commission for the River Plate Maritime Front, particularly regarding the research and management of fisheries in the Argentinian/Uruguayan Common Fishing Zone. In Brazil the ten permanent working groups responsible for providing advice on the management and development of fisheries along the Brazilian coast, continued to update information and data on the assessment of the fish stocks of Brazil, although they have been less active in recent years.

SOUTHEAST ATLANTIC (Area 47) (Table 9)

Total catches in this area remained relatively stable at about 2.1 to 2.3 million tons per year between 1980 and 1986, but increased to 2.7 million tons in 1987, only to decrease again to 2.4 million tons in 1988. Most of the fluctuations in recent years are due to changes in the total catches of anchovy (Engraulis capensis) and to a lesser extent, cape horse mackerel (Trachurus capensis). These two species together with the hakes (Merluccius capensis, M. paradoxus, and M. polli), sardinellas (Sardinella aurita and S. maderensis), pilchard (Sardinops ocellata) and Cunene horse mackerel (Trachurus trecae) made up 85% of the total catches in 1988.

A large share of the catches (43%) was taken by distant water fleets operating mainly off Namibia and Angola (ICSEAF Fishing Divisions 1.2, 1.3, 1.4 and 1.5). This situation arose because there was no coastal state control over fishing off Namibia while Namibia's independence was pending, and therefore this area became one of the few free fishing grounds left in the world after the Law of the Sea went into effect. In the same area Angola, which became independent 15 years ago, has been emphasizing the development of its small-scale coastal fishery, and did not place many restrictions on foreign fishing vessels operating in its 200 mile zone.

Upon independence, Namibia requested all foreign fleets to cease their fishing activities off the Namibian coast, pending the approval of a national fishing law, the declaration of a 200 mile Exclusive Economic Zone, and the definition of a national policy regarding fisheries in the newly independent coastal state. Several options are being considered at the time of writing this report, and further studies on the state and potential yields of fish stocks are now being undertaken to help in the decision-making process regarding the exploitation of Namibian fishery resources.

Fishing by large distant-water fleets in the 200 miles zone off Namibia ceased completely after the second quarter of 1990. Although it is still too early for this to be reflected in the

available statistics, this would certainly cause a reduction in total catches in ICSEAF Divisions 1.3 to 1.5, and hopefully will contribute to the recovery of some of the fish stocks that have been severely reduced due to heavy fishing in the past.

Hakes are the main and most abundant demersal stocks in this area. After catches of more than 800 000 t per year in the early 1970's, catches of hake decreased to about 430 000 t in 1988. These stocks are exploited by foreign long-range fleets in the north (ICSEAF areas 1.3 to 1.5) and by coastal South African fleets south. All the stocks have been overexploited, although the most southern stocks seem to show some sign of recovery.

Of the several pelagic stocks of commercial importance in this area, the most abundant ones are the cape horse mackerel and the anchovy. The cape horse mackerel yielded a catch of almost 580 000 t in 1988, and is considered to be moderately to fully exploited, although this stock is known to be highly variable. This stock is mostly fished by foreign long-range fleets. The anchovy stock is exploited almost entirely by coastal South African fleets, and yielded almost 680 000 t in 1988. These stocks are considered to be fully exploited.

Another important pelagic stock in this area is the sardinella, which is currently exploited by the USSR and Angola. The catch of this species was of 130 000 t in 1988, and the stock is moderately exploited. The Cunene horse mackerel is being intensively exploited by USSR and Angolan fleets, with total reported catches of 130 000 t in 1988. The chub mackerel stocks are heavily exploited, and the pilchard stock which collapsed in the 1960's and early 1970's continues to be depleted, showing no sign of recovery. A high biomass of round herring (Etrumeus whiteheadi) exceeding 1 million tons in ICSEAF Divisions 1.6 and sub-area 2, was reported at the Standing Committee on Stock Assessment during the Tenth ICSEAF Regular Session held in Palma de Mallorca, Spain, in November-December 1989. Total catches for this species are in the order of 60 000 t per year, and the perspectives for further development are promising.

Due to the lack of suitable stock assessment data, little can be said about the state of other fish stocks being exploited in this area, such as soles, kingklip, monkfish, dentex and squids.

Until 1989 the exploitation of the stocks of this region was monitored through the International Commission for the Southeast Atlantic Fisheries (ICSEAF) which was mainly concerned with the international assessment, monitoring and management of fisheries in the unclaimed waters off Namibia. This regional Organization decided to cease its operation early in 1990 following the declaration of independence by Namibia in April 1990. Namibia is now managing fisheries in its Exclusive Economic Zone which was declared in July 1990.

WESTERN INDIAN OCEAN (Area 51) (Table 10)

Total recorded landings in the area were 2.9 million tons in 1988, compared to landings of 2.7 million tons in both 1986 and 1987. The ten major fishing countries, with their total catch in brackets in thousand tons are: India (1 205), Pakistan (349), Oman (166), Sri Lanka (160), Iran (129), UAE (86), Yemen (73), Maldives (71), Tanzania (47) and Saudi Arabia (47).

Landings in India were 1.2 million tons in 1988 compared to 1.1 million tons in 1987 and 1.2 million tons in 1986. The demersal finfish catch is comprised of a large number of different species, with croakers, Bombay duck and catfish being the most important. Principal pelagic species include Indian oil sardine, Indian mackerel, and anchovies. The total landings of shrimps has remained relatively stable, but a shift in species towards smaller, less valuable species has been observed. The shrimp stocks appear to be heavily exploited.

Landings by Pakistan increased to 350 000 tons in 1988. Landings of shrimps have remained at a fairly constant level from 1982 to 1988, around 28 000 tons, and the shrimp resources appear fully exploited or overfished. Attempts have been made to encourage the fishery to move to underexploited resources in deeper waters.

Omani landings have increased from around 100 000 tons from 1983 to 1986 to 166 000 tons in 1988, the main catches being pelagics (tunas, kingfishes and small pelagics) caught by gillnets. The Norwegian research vessel "DR FRIDTJOF NANSEN" surveyed Omani waters (1983-84) and found these to be very productive areas. This survey gave an estimate of biomass for small pelagics (scads, mackerels and sardines) of 1.2 million tons and a demersal biomass of 345 000 tons (seabreams, catfish, croakers, grunters and emperors). The MSY has been estimated at 270 000 tons of pelagics and 77 000 tons of demersal fish.

Sri Lanka's marine landings have dropped from a level of 180 000 tons in the early 1980's to a level of 140 000 tons in 1985-86 but increased to 160 000 tons in 1988. Tuna and small pelagic species (sardines) caught by gillnets form the bulk of their catches.

Landings by Iran have remained at a level of around 125 000 tons from 1986 to 1988. Shrimps landings were around 5 000 tons per year. Tuna and other large pelagics yielded some 20 000 tons per year. Stocks appear to be lightly exploited.

Landings in the United Arab Emirates increased from 73 000 tons in 1983 to 86 000 tons in 1988, with pelagics (tunas, kingfishes, scads, sardines) forming the main catch. A second important group is the demersal fishes (Emperors, groupers, snappers).

The recorded langings in the now unified two Yemens equalled around 73 000 tons. Landings have remained constant since 1986 with the major catch being pelagics.

Maldives' landings, primarily for tuna and tuna-like species caught by the traditional pole and line fishery, equalled 71 000 tons in 1988. Considerable resources of reef fish (groupers, snappers, etc.) are virtually unexploited.

Total annual landings in the Gulfs (including all of Oman) have increased from 230 000 tons during the period from 1977 to 1980 to 450 000 tons in 1988. Collection of catch statistics has improved considerably during recent years in the Gulf countries.

Shrimp landings by Kuwait increased from 2 000 tons in 1984 to 5 000 tons in 1988, a record high, and the Saudi Arabian landings have increased from about 1 700 tons in 1984 to 5 500 tons in 1988, down from a record high of 7 000 tons in 1987.

Total landings in the Red Sea and the Gulf of Aden have gradually increased. Small pelagics, sardines and Indian mackerel, are believed to be underexploited there.

Total landings in countries bordering the South Western Indian Ocean, excluding landings by foreign fleets, have gradually increased from 120 000 tons in 1977 to 162 000 tons in 1988.

France, Spain, Taiwan (Province of China), Korea and Japan were the principal foreign countries fishing for tuna and tuna-like species in the area. This fishery started in 1981 and recorded a catch of 350 000 tons in 1988. The state of the stocks of oceanic tuna are covered in Table 19 on tunas.

The major shrimp catching countries in the South Western Indian Ocean in 1988 were Madagascar (10 000 tons) and Mozambique (5 700 tons).

Except for pelagic resources off Somalia, Mozambique and most likely Madagascar, most stocks in the region are considered fully exploited. The Saia de Malha banks, north of Mauritius may have underexploited resources.

Large unexploited resources of mesopelagic fish (lantern fish) have been detected by the Norwegian research vessel "DR FRIDTJOF NANSEN", but no economic way of catching these fish has been devised. In most cases the concentrations are not high enough for economic exploitation by purse seines or midwater trawl. It remains an open question whether the mesopelagic stocks represent potential fisheries for the area.

The Indian Ocean Fishery Commission (IOFC) is the regional organization for the Indian Ocean (Area 51 and Area 57) that assists and coordinates national programmes in fisheries

development, promotes regional research activities and examines management problems relating to offshore resources. Special committees are set up for the management of fish stocks in the Gulfs, Southwest Indian Ocean, Bay of Bengal and the Indian Ocean tuna. These committees have not so far regulated fisheries but act as advisory bodies in the management of the fishery resources in the various countries in the region.

EASTERN INDIAN OCEAN (Area 57) (Table 11)

The reported landings in this area were 2.7 million tons in 1988, a record catch, but up only slightly from the catches in 1986 and 1987. The major fishing countries in the area, with percent of catch in brackets, are India (23%), Myanmar (21%), Indonesia (15%), Thailand (14%) and Malaysia (13%).

Myanmar continues to report only total landings, and Bangladesh just toli shad, crustacea and mixed fish. Other countries also report large landings of miscellaneous fish and, as a result, just over 50% of the total landings are classified by species.

The total catch by India in this area has been quite stable at approximately 500 000 tons per year, suggesting that the fishery is fully exploited. Some concern has been expressed over the highly efficient high-opening trawl gear which may conflict with small-scale fisheries.

The demersal trawl fishery in north west Australia has been fished by non-Australian vessels since the early 1960's. The resources are considered overexploited and foreign fishing effort has tapered off. A large number of species is taken in the southeast demersal trawl fishery, but catches in recent years have been dominated by orange roughy at 800-1200 m depths. The status of the stock is presently unknown.

The development of a new longline fishery has occurred in the Indian Ocean off Indonesian's archipelago. Although longline fishing started as early as 1972, it is only in 1987 that the longline fishery had developed extensively, and this occurred following the success of licensed foreign boats fishing off the Indonesian fishing zone. The fishing season is generally short and it is aimed at catching tuna for sashimi consumption in Japan. In 1989 nearly 300 boats were fishing in the area with an estimated catch of 17 000 tons.

Trawl surveys in the Bay of Bengal have indicated a limited resource of fish and shrimp in deeper waters, but the rough configuration of the bottom and the cost of deep water trawling suggests that other types of gear should be considered for this resource. Bangladesh recently reported a new source of brown shrimps off their southern coast. However, most of the nearshore areas appear to be fully exploited.

An evaluation of the marine shrimp resource of Myanmar indicated heavy exploitation of the stocks along the Tenasserim coast, while the Rakhine area shows no clear evidence of over-exploitation. Suggestions have been made for improving the statistical system of catch records and for the collection of biological data. Recent estimates have been made of the biomass of the demersal fish stocks in both Myanmar and Bangladesh.

A deepwater (200-800 m) prawn and scampi fishery is developing in southeast Australia. The catch has fluctuated widely and the status of the stocks is poorly known.

The assessment and management of fish resources, with some exceptions, are generally at a low level throughout the region. Many coastal pelagic stocks, both small and large sized species including coastal tunas and Spanish/King mackerels, are believed to be lightly exploited in the northern part of the region, but adequate assessment is not available. Information is also lacking on the cephalopod resources.

The state of the stocks of oceanic tuna fished in this area are covered in Table 19 on tunas. The Indian Ocean Fishery Commission (IOFC) is the regional organization for the Indian Ocean and information on the Commission is covered under Area 51.

NORTHWEST PACIFIC (Area 61) (Table 12)

The total catch increased slightly in 1988 to 26.7 million tons compared to the catch of 25.9 million tons in 1987. Alaska pollack and Japanese pilchard landings were again the dominant species in the area, together accounting for 40% of the total landings.

The fishery for Alaska pollack in the northwestern Pacific has the highest yield for any single demersal species in the world. The landings from 1986 to 1988 have remained around 5.1 million tons. Most of the catch in 1988 was taken by the USSR, Japan and Poland. The stocks are considered to fully exploited.

The catch of Pacific cod is the second largest single species catch in the demersal fishery and the stocks appeared to be fairly stable through the early 1980's with landings of around 80 000 tons. However, the catch of cod has increased to over 200 000 tons in recent years, primarily from incidental catches directed at other target species such as pollack and flatfish.

Serious overfishing is evident in many of the demersal stocks in the southern region, including the Yellow Sea and East China Sea. The abundance of the demersal stocks of commercial value in this region is estimated to be one-fifth to one-tenth of their previous levels, and there has been little sign of recovery.

Salmon stocks in this region are generally in good condition with the exception of chum salmon originating from USSR rivers. Intensive restocking programmes in the USSR rivers should help the recovery of chum salmon stocks.

The coastal pelagic fish stocks in this area are very productive. They exhibit large fluctuations in abundance, and change dramatically in dominance from one species to another. An example of this has been the change in abundance of the Japanese pilchard around Japan. The catch in the mid-1960's was around 9 000 tons, but exceeded 5.4 million tons in 1988, making it one of the world's largest single species catches. Management of such unstable pelagic fish stocks is quite difficult, and requires frequent monitoring of the population. Clear causes of these changes are unknown; it has been generally accepted that they are probably natural causes and there is little evidence of a direct link with fishing.

The annual landings of the Japanese flying squid continues to decline from over 400 000 tons in the early 1970's to 200 000 tons in 1988. The causes for this decline are unknown but Japan has prohibited fishing during the major fishing seasons in the Japan Sea to protect the spawning stocks. The cephalopod stocks around Japan are considered fully exploited, but the oceanic squids in the northern region, along with neritic cephalopods in the southern region, could provide substantially larger catches.

Prawn and shrimp stocks are considered fully exploited, and little change in the landings is expected, except for fleshy prawn (Penaeus chinenesis) which has increased to a catch of 250 000 tons in 1988.

At present, there is no functional multilateral organization to cover the entire area, although such an organization would be helpful in the assessment and management of shared fish stocks. Present research and management are the responsibility of the individual coastal countries. Five bilateral fishery agreements between individual countries currently exist in the region through which management of the shared stocks are partially conducted.

NORTHEAST PACIFIC (Area 67) (Table 13)

The total catch has gone up slightly from 1985 to 1988 with the annual catch for these years equal to 2.9, 3.2, 3.5 and 3.3 million tons respectively. Alaska pollack accounted for a little less than half of the total catch in this region. The USA catch accounted for a large percent of the total due to joint ventures.

Total landings of the major salmon stocks were estimated to be 334 000 tons in 1988, compared to the range of 320 to 435 000 tons landed annually since 1980.

Canada, Japan and the USA have exchanged views within the framework of the INPFC with regard to the squid driftnet fishery and its interaction with salmon fishing. Arrangements were entered into by the three countries providing for monitoring of the driftnet fishing fleets.

Halibut stocks are closed to fishing by non-coastal countries. Recent halibut landings were quite stable from 1986 to 1988, with catches ranging from 41 to 43 000 tons. This was close to the record landings which occurred in 1962. The stock biomass increased during the 1970's, and peaked in 1986. Although the stocks are still healthy, a decline in biomass appears to have begun and will probably continue if cyclic environmental conditions are less favorable. Management strategies have restricted the commercial harvest, and called for catching approximately 75% of the estimated annual surplus production. Problems continue to occur in restricting the amount of fishing effort, particularly the number of US vessels.

The catch of yellowfin sole in the Bering Sea reached a record level in 1988 after a long period of increasing catches starting in the early 1970's. The catch of "other flatfish" has been at a high level since the early 1980's.

Alaska pollack landings remained high in the region in 1988, down slightly from 1986 and 1987. The biomass of this stock in the eastern Bering Sea remains high, but some concern has been expressed over the impact of catches in the international zone of the Aleutian Basin (outside 200 miles the so-called "donut hole") on the eastern Bering Sea population. Some believe the total Bering Sea biomass is declining, and that fishing may be excessive.

Pacific cod catches continued to rise since the mid 1970's. The biomass has also increased substantially, and remains near a record level.

Pacific Ocean perch stocks remain at a continued low level but have improved during the 1980's. Several strict management measures have been imposed on the fishery for some time now, and recent evidence suggests that the condition of the stocks has shown limited improvement.

Sablefish resources in the Gulf of Alaska are in good condition. Landings in the region totalled round 52 000 t.

Pacific herring is the only coastal pelagic fish resource being exploited in the area. Their abundance has increased slightly, and the total landings have been quite steady in the 1980's.

A Pacific Salmon Treaty was enacted in 1985 between Canada and the USA in order to enable the countries to reap the benefits of their respective management and enhancement efforts. A

Pacific Salmon Commission establishes general fishery management objectives for international conservation and harvest sharing of intermingling salmon stocks.

The International Pacific Halibut Commission (IPHC) with membership of Canada and the USA deals with research and management of the Pacific halibut resources in the entire area. Fishing for salmon and halibut is completely prohibited for other countries in this area.

WESTERN CENTRAL PACIFIC (Area 71) (Table 14)

The total catch from the area reached a record of 6.9 million tons in 1988. Most of the catch is taken along the continental shelves by Indonesia, Malaysia, Philippines, Thailand and Vietnam. The total catch of each of these countries has increased over the past decade with the exception of Malaysia. These fisheries are characterized by their strong dependence on demersal and small pelagic fish resources, primarily small-scale artisanal fisheries.

The total demersal fish catch of the area has levelled off at between 600 000 and 800 000 tons from 1983 to 1988. Most stocks in nearshore waters are heavily exploited. The heaviest fishing occurs in the inner part of the Gulf of Thailand, the Strait of Malacca, the shallow part of the southern Java Sea and the inshore areas of the central Philippines. Increased landings are doubtful here until an adequate management scheme is employed, e.g., a combination of reduced fishing effort, mesh size regulations and probably, the seasonal closure of spawning and nursery areas for the major stocks.

The demersal stocks in deeper, offshore waters may not be fully exploited in most areas with the exception of the Gulf of Thailand, and the central to southern part of the Strait of Malacca. However, there is a need for controlled expansion of fishing effort in offshore waters to prevent trawl overfishing there as well.

The shrimp and demersal stocks in the Arapura Sea have been exploited through joint venture arrangements; Indonesia with Japan for shrimp fishing, and Taiwan for demersal trawling, and Australia with Thailand for demersal trawling. Preliminary assessment indicates that both shrimp and demersal stocks are fully, if not overexploited.

New developments have occurred in the South China Sea waters of Indonesia. Foreign boats have been granted fishing rights from 12 miles off the islands and 50 trawlers and 100 purse seiners have been fishing the area. An estimated 5 000 tons of demersal fish and 10 000 tons of pelagic fish have been landed, comprised primarily of round scad, mackerels and small tunas.

The landings of both the small coastal and large pelagic species have been increasing slowly over the past decade in the region. The assessment of these stocks is hampered by inadequate statistics, incomplete knowledge of the geographic limits of a number of stocks in the area and, in some cases, uncertain identification of the several species involved. Several local stocks of small coastal pelagic fish have been fully or nearly fully exploited, e.g., mackerels and round scads in the Strait of Malacca and the inner part of the Gulf of Thailand, round scads in the Philippines, and sardines in the Bali Strait. Larger coastal pelagic fish have probably been slightly to moderately exploited in recent years.

Coastal penaeid shrimp resources, especially tiger and banana prawns, are being fully fished (or possible overfished) in northern Australia. The fishery is managed by input control and by permanent and seasonal closures of some areas.

Most prawn/shrimp stocks in the Asian waters are heavily fished. Catches in the area have levelled off during the past decade at 320 to 450 000 tons.

Cephalopods are probably the only major resource in the region for which there is still ample room for increased fishing effort, with a potential annual catch of several hundred thousand tons. The annual catch has stabilized in recent years at around 180 000 tons.

Japan, the Republic of Korea and the USA have all engaged in offshore fishing for skipjack and larger tunas, although the USSR has engaged in some coastal fishing for both demersal and pelagic fish in the western part of the area.

No multi or bilateral arrangements have been made so far to deal with resources management. However, the Indo-Pacific Fishery Commission (IPFC) of FAO and the IPFC Committee for the Development and Management of Fisheries in the South China Sea (CDMCS) cover the geographic area, countries and subjects relevant to the development of fisheries in the area. Neither the Commission nor the Committee have introduced measures to manage fisheries within their areas of responsibility to date.

EASTERN CENTRAL PACIFIC (Area 77) (Table 15)

The boundaries of this statistical area have been changed, and the coastal zones of Colombia and Ecuador are now included in Area 87. Species and area totals have been revised accordingly.

Total catches in this area have remained stable at around 1.6 to 1.8 million tons per year for several years. Fishing in this area is supported by pelagic species in terms of volume of catches, and by shrimp species in terms of value.

Except for the Central Pacific anchoveta (Cetengraulis mysticetus) and the Pacific thread herring (Opisthonema spp.), the catches of most small pelagic fish stocks have been relatively stable during the last few years. Reported catches of Central Pacific anchoveta off Panama dropped from 127 000 tons in 1987 to 40 000 in 1988, after a maximum of 224 000 tons in 1985. After fluctuating for several years, catches of Pacific thread herring, mostly off Panama, increased from 11 000 tons in 1987 to 40 000 tons in 1988. These two stocks are moderately to fully exploited.

The chub mackerel (Scomber japonicus) is moderately exploited in this area, and total catches have been maintained at around 50 000 tons per year. The Pacific jack mackerel (Trachurus symmetricus) is lightly exploited, and catches have remained slightly above 10 000 tons per year for several years.

The Californian sardine (Sardinops caeruleus) is moderately to fully exploited, and during recent years total catches have been maintained at around 440-480 000 tons per year. This fishery collapsed in the USA in the 1950's and at the moment the stock is only being exploited by Mexico. The stock of Northern Pacific anchovy (Engraulis mordax) is lightly exploited, and in recent years total catches have been around 120-170 000 tons per year. A catch of 120 000 tons was reported in 1988, and the main fishing nation is Mexico.

Catches of tuna have also been relatively stable since the decline in 1982-83, and have recovered slightly. The catches of skipjack tuna (Katsuwonus pelamis) have been stable at about 60 to 80 000 tons per year between 1980 and 1986, after a catch of 140 000 tons in 1981. Catches of yellowfin tuna (Thunnus albacares) increased from 130 000 tons in 1983 to 280 000 tons in 1986 and to 292 000 tons in 1988. This stock seems to be fully exploited. The albacore (Thunnus alalunga) and Bigeye tuna (Thunnus obesus) are moderately exploited and their total catches are relatively stable at about 25 000 tons and 72 000 tons per year respectively.

Shrimp stocks (mostly Penaeus spp.) are fully to heavily exploited almost everywhere in the area. However, the stocks off Nicaragua seem to be lightly to moderately exploited. Catches of squat lobster (Pleuroncodes planiceps) declined from 12 000 to 2 000 tons 1987 to slightly over 3 000 tons in 1988. This stock seems to be lightly exploited and good concentrations have been reported by the R/V "DR FRIDTJOF NANSEN" which surveyed the area in 1987. These surveys, conducted as a part of a UNDP/NORAD/FAO Project, also confirmed a total biomass of more than 1 million tons of small pelagic stocks in the area, and another 250 000 tons of demersal stocks.

An increase in the catches of squids has also been reported in this area, with total catches of 77 000 tons in 1988. These stocks are lightly exploited and offer some potential for further development, although they are highly variable.

SOUTHWEST PACIFIC (Area 81) (Table 16)

This area includes waters off southeastern Australia, New Zealand, several island communities, and a large area of deep ocean water. Total catches for the area have continued in an upward trend, although the catches for 1987 and 1988 were very similar at a record 900 000 tons.

Off southeastern Australia, over 60 species of fish are taken in the demersal fish catch, but catches tend to be dominated by a few species. Total catch in this region reached 15 000 tons in 1989; gemfish, redfish and ocean perch stocks are probably overexploited, and a number of other species fully exploited. The trawl fishery has been heavily influenced by the discovery of large stocks of orange roughy further to the south in FAO Area 57 and some fishing effort has been directed to the new stock.

Catches of coastal demersal fishes around New Zealand were about 470 000 tons in 1989. The major demersal stocks are probably fully exploited. The statistics on catch and fishing effort for many species are considered inadequate for satisfactory stock assessments.

A trawl survey was conducted to estimate the catch rate and biomass of the fish stocks off the shelf and upper slope off southern New Zealand. Barracouta and spiny dogfish were the most abundant species.

The landings of grenadier increased rapidly from 43 000 tons in 1985 to 257 000 tons in 1988. The increased catches of grenadier account for most of the recent increase in landings in this area.

The total allowable catch of orange roughy off New Zealand has been reduced in the past three years for three of the six stocks.

Rock lobster is the most valuable inshore fishery off New Zealand. Concern has recently been expressed over the status of the resource. The fishery is now believed to be fished beyond its full potential and the resource is declining because of current high fishing effort. Biologists are predicting seriously diminishing catch unless there is some reduction in fishing effort.

New South Wales is the major center for oyster farming in Australia. Prawn fisheries are more prevalent in the north of the region, with a variety of continental shelf and upper slope species dominating trawl catches in the south.

Both Australia and New Zealand have reduced their catch quota of southern bluefin tuna due to falling recruitment of juvenile fish.

Landings of cephalopods have levelled off at around 100 000 to 125 000 tons but they probably are one of the stocks capable of increased catches, particularly in oceanic waters.

The New Zealand Fishing Industry Board is resposible for the management of fisheries under New Zealand jurisdiction, and through the adoption of an individual transferable quota system has been able to stabilize a number of fisheries at good economic levels.

SOUTHEAST PACIFIC (Area 87) (Table 17)

The boundaries of this statistical area have been changed and the coastal zones of Colombia and Ecuador are now included in this area. The species and area totals have been revised accordingly.

After the decrease in catches in the 1970's and early 1980's following the collapse of the Peruvian anchoveta, total catches in this area have been recovering, and since 1985 they have always been above 10 million tons per year. In 1986 total catches in this area increased to 13 million tons and then dropped to 11 million tons in 1987, partially due to the influence of a mild "El Niño" phenomenon that caused a reduction in catches of some fish stocks, particularly the anchoveta. In 1988 total catches for this area increased again to 13.6 million tons, which is just below the record catches of 13.8 million tons in 1970, when the anchoveta fishery was at its maximum.

Fishing in this area is strongly dominated by small pelagics, which in 1988 represented around 90% of the total catches in volume. The most important pelagic fish stocks being exploited in the area are the sardine (Sardinops sagax), the Peruvian anchoveta (Engraulis ringens) and the jack mackerel (Trachurus murphyi). These three species alone made up almost 87% of the total catches. Other small pelagic fish stocks of relative importance in the area are the Pacific breams (Seriolella spp.), the eastern Pacific bonito (Sarda chiliensis), and the chub mackerel (Scomber japonicus). The most important demersal fish stocks are the Chilean hake (Merluccius gayi), the Patagonian grenadier (Macruronus magellanicus) and the Patagonian hake (Merluccius polylepis).

After the record catch of 5.8 million tons in 1985 total catches of sardine dropped to 4.3 million tons in 1986, and then recovered to almost 5 million tons in 1988. This stock is mainly exploited by Peru, whose catches have been increasing in the last few years, and Chile, whose catches have been decreasing. The stock is considered to be fully to heavily exploited, and there is some concern due to some signs of overexploitation.

Catches of Chilean jack mackerel have also been increasing during the last few years, with record catches of 3.2 million tons reported for 1988. This species has a very wide

distribution in the southeast Pacific, and, in the coastal area is exploited by Chilean and Peruvian fleets, and offshore by long-range fleets from the USSR and Cuba. Catches by the coastal Chilean fleet have been increasing consistently and reached 2.1 million tons in 1988. The catches of the coastal Peruvian fleet have been variable with 120 000 tons reported for 1988. The stock is also actively exploited by foreign long-range fleets beyond the 200 mile zone, and the reported catches of the USSR fleet, the main offshore fishing country in this area, have increased to almost 1 million tons in 1988. The abundance of this stock seems to have increased over the past years, and the expansion in its distribution makes it very difficult to assess the long-term potential. Although catches are relatively high it is still considered to be moderately exploited.

Catches of Peruvian anchoveta dropped to less than 1 million tons in the early 1980's, recovered to almost 5 million tons in 1986 and then dropped to 2.1 million tons in 1987 due to a mild "El Niño" phenomenon. Catches of this species recovered to 3.6 million tons in 1988. It has been exploited primarily by the Peruvian coastal fleet off northern Peru, and also by the Chilean coastal fleet off northern Chile. This stock is highly variable, and under the present conditions is estimated to have a potential yield in the order of 2 to 5 million tons per year. It is considered to be fully to heavily exploited, and although the purse-seine fleets off Peru and Chile are also targetting on other small pelagic species, they still maintain a heavy pressure on the Peruvian anchoveta.

Catches of the eastern Pacific bonito and the chub mackerel have been increasing slightly over the last few years. Captures of other small pelagic species, such as the South Pacific breams (Seriolella spp.), and the Chilean herring (Strangomera bentincki) have been more or less stable.

Catches of the Patagonian grenadier have been consistently increasing from around 20 000 tons per year in the early 1980's to 112 000 tons in 1988. Catches of Patagonian hake have also increased from around 20 000 tons in the early 1980's to almost 70 000 tons in 1988. These two stocks are exploited off the coast of southern Chile. Catches of Chilean hake dropped to less than 50 000 tons in the early 1980's, but increased to almost 150 000 tons in 1988. This stock is being exploited off northern Peru and central Chile.

Catches of squid reached 19 500 tons in 1985, dropped to 4 800 tons in 1987, and increased slightly to 7 200 tons in 1988. The potential yield of these stocks is believed to be much higher, although subject to high variability. Stocks of squids are virtually unexploited in this area, and they offer a promising perspective for further development.

SOUTHERN OCEANS (Areas 48, 58 and 88) (Table 18)

The total catch in the Southern Ocean was 458 000 tons in 1987/88 up from 264 000 tons in 1984/85, but down from the record catch of 653 000 tons in 1981/82. Most of the catch is for krill, accounting for 81% of the total in 1987/88. The bulk of both finfish and krill taken in the Southern Oceans comes from the waters around the islands of South Georgia and South Orkney in the Atlantic Ocean (Area 48).

The major catch of finfish consists of Antarctic cod and Patagonian rockcod (Nototheniidae), and icefish (Channichthyidae). The most important species in the 1988 fishing season was the icefish Champsochephalus gunnari. Very large fluctuations in year class strength and thus catches have been observed for this species.

The krill catches were 375 000 tons in the 1987 season and 370 000 tons in 1988. Most of the catch is taken by the USSR and Japan. The estimated biomass and potential yield of the krill resources still remain unknown.

The potential for the squid stocks is unknown and they have been relatively unexploited.

The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) is the regulatory body for the area. It collects data on catch and effort, assesses the size of fish stocks, and recommends management measures. Assessments were made for the major exploited fish stocks and it was concluded that they are all overfished. CCAMLR established two scientific working groups on krill biology and resources, which had their first meetings in 1988.

OCEANIC TUNAS AND BILLFISHES (Table 19)

The total annual catch of tunas and billfishes has been steadily increasing from an average of about 1.9 million tons in the early 1970's (1970-74) to 3.8 million tons in 1988, a 95% increase. The annual catch of principal market tuna species (northern and southern bluefin tuna, bigeye tuna, yellowfin tuna, albacore and skipjack) increased from 1.4 to 2.5 million tons, an 83% increase. The latter increase resulted mainly from doubling the skipjack and yellowfin catches. For the other principal tuna species, the catches remained steady (bigeye tuna and albacore) or even declined (southern and northern bluefin tuna).

The geographic distribution of catches changed from 1983 to 1988. The Atlantic Ocean landings declined slightly from 575 to 557 000 tons while the Pacific Ocean catches increased from 2.0 to 2.5 million tons. Catches increased at an even faster rate in the Indian Ocean from 556 to 769 000 tons. Changes to the geographical distribution of principal market tuna species followed similar general trends.

The shifts in the distribution of catches were due to both changes in locations of distant-water fishing fleets and increased fishing by nations in their own waters. Some Spanish and French purse-seiners moved from the Atlantic Ocean to the Indian Ocean, while a part of the US purse-seine fleet moved from the eastern to the western Pacific, and some US purse-seiners expressed an interest in fishing in the Atlantic Ocean off West Africa, and in the Indian Ocean around Seychelles. The Republic of Korea and Taiwan are continuing purse-seine operations in the western Pacific. In southeast Asia countries, tuna fisheries are growing mostly in the artisanal sector.

The principal countries fishing for tuna and tuna-like species in 1988 with total catch in thousand of tons were: Japan (781), Indonesia (325), Philippines (300), USA (292), Spain (256), Republic of Korea (190), Taiwan (Province of China) (189), France (153) and Mexico (125). For the principal market tuna species, the countries and tonnage were: Japan (259), USA (140), Spain (128), Taiwan (Province of China) (123), Mexico (114), France (39) and Republic of Korea (83).

The total landings of principal tunas by traditional tuna fishing nations (Japan, USA, Taiwan (Province of China), Republic of Korea, Spain, and France) were quite similar from 1980 to 1988 while the catch of the remaining countries, mostly developing countries, nearly doubled.

The use of major fishing methods is changing. Pole and line and longline fishing have declined somewhat while purse-seining is increasing. This has resulted in increased catches of small yellowfin and skipjack, while catches of big yellowfin, albacore and billfish have remained fairly stable. The other gears used are troll lines, hand lines, driftnets, traps and harpoons. Natural or artificial fish aggregating devices (FADs) are often utilized in conjunction with purse-seining or hand-lining.

The skipjack and the yellowfin tuna contributed most of the total catch of principal tunas (49% and 34%, respectively in 1988), followed by the bigeye tuna (7%), albacore (7%) and the northern (1%) and southern (1%) bluefin tuna. The last two species and the bigeye tuna are regarded as highly suitable for eating in a raw form (sashimi) and prices for the highest quality fish have reached over US $ 200 per kilogramme. The remaining species are also used for sashimi, but mostly for canning.

72% of the skipjack, 65% of the yellowfin and 58% of the bigeye tuna were taken in the Pacific in 1988. Catches of albacore were comparable in the Pacific (44%) and Atlantic (38%). The northern bluefin tuna were taken mainly in the Atlantic and some in the Pacific. Most of the southern bluefin tuna were taken in the Indian Ocean. The catch distribution among the three oceans is, with few exceptions, very similar to that in the early 1970's.

With the exception of two spearfish species, billfish and swordfish have very wide, oceanic distributions, similarly to the principal market tuna species. In addition to being an excellent sea food, they are among the world's most sought-after game fish. Most of them are caught in the Pacific (53%) and Atlantic (33%) with the remainder in the Indian Ocean. Since the early 1970's, their catches have more than doubled in the Atlantic and the Indian Ocean, but only moderately increased in the Pacific.

Excluding slender tuna and butterfly kingfish, small tunas and seerfish have more restricted coastal distributions. They are mostly taken off southeast Asia in the Pacific (65%) and in the Indian Ocean (43%). Since the early 1970's, their catches have increased especially rapidly in the Indian Ocean (nearly five times) and in the Pacific (over two times), but have only increased by one third in the Atlantic.

Most of the principal market species, with the exception of skipjack, appear to be fully utilized throughout the world or over-exploited. The best situation for the resource is probably in the Indian Ocean, where the tuna and tuna-like fisheries operated at relatively low intensity until the early 1980's. However, the present status of these stocks is less well-known, because they have been studied for a shorter period and with less effort than some of the stocks in the Atlantic and Pacific.

The status of billfishes, swordfish, small tunas and seerfishes is generally even less known than that of principal market tuna species. This is because of incomplete fisheries statistics and very limited biological information. However, some concerns have been expressed about blue marlin and white marlin in the Atlantic. There are some indications that sailfish are moderately exploited in the western Atlantic and not fully exploited in the eastern Atlantic. Similarly, the Pacific swordfish appears to be moderately exploited. Very little is known about the status of billfish and swordfish in the Indian Ocean, but the latter species seems to be underexploited.

Many countries are concerned by the recent increased use of large-scale pelagic driftnets on the high seas, which are highly unselective, and its effects on non-targetted marine species including the albacore resources, particularly in the North Pacific, South Pacific and Indian Oceans, and the swordfish resources in the Mediterranean. In response to these concerns, the General Assembly of the United Nations adopted a Resolution recommending a moratoria on all large-scale pelagic driftnet fishing on the high-seas by June 1992. Such a measure "will not be imposed in a region or if implemented, can be lifted, should effective conservation and management measures be taken based upon statistical sound analysis to be jointly made by concerned parties of the international community with an interest in the fishery resources of the regions, to prevent unacceptable impact of such fishing practices on that region and to ensure the conservation of the living marine resources of that region"

(FAO, Fish.Rep.434). The issue has been of concern to various individual countries as well as regional and global international organizations.

Another area of concern are dolphins incidentally caught by purse-seiners which are targetted primarily on yellowfin in the eastern Pacific. In response to this problem, research and monitoring have been conducted to reduce the incidental mortality of dolphins and some management restrictions have been imposed. Recently, many canneries have stopped accepting tuna that are caught with dolphins. This will have implications not only on the fishing operation in the eastern Pacific, but also in other areas like the western Pacific where the eastern Pacific purse-seine fleet may move.

Because of the wide geographical distribution of many tuna and tuna-like species and their migration, and the high mobility of the fishing fleets, research as well as management of tuna and tuna-like fisheries needs to be carried out cooperatively by all countries concerned. Therefore, many international commissions and programmes devoted solely to these species have existed for many years. In the Atlantic, the International Commission for Conservation of Atlantic Tuna (ICCAT) is the primary organization. In the eastern Pacific, the Inter-American Tropical Commission (IATTC) has played a major role. In the eastern Indian Ocean and the western Pacific (FAO's Indo-Pacific Fisheries Commission (IPFC) has a Tuna Management Committee. The Forum Fisheries Agency (FFA) has been set up to advise its member countries on a wide range of technical and policy matters related to the use and management of fisheries resources in the South Pacific. It gets research support from the South Pacific Commission (SPC). In the Indian Ocean, FAO's Indian Ocean Fisheries Commission (IOFC) has a Tuna Management Committee and its work is supported by the FAO/UNDP Indo-Pacific Tuna Development and Management Programme (IPTP). Steps are being taken to create an Indian Ocean Tuna Commission.

From these organizations, only IATTC, SPC and, to a limited extent, IPTP and FFA, have research capacity. In other areas, research is carried out mainly by the countries concerned. However, all the organizations facilitate the exchange of data and scientific information and the consideration of research and fisheries management issues. Apart from the Commissions, direct management agreements among the countries concerned are negotiated.

The suggestion has been made to establish a single world-wide organization for research and management of tuna fisheries because of high mobility of tuna fishing fleets. Such an organization might be similar to that in existence for whales but with regional commissions. Major issues to be tackled include the explicit limitation of overall fishing effort, the allocation of tuna resources between coastal and non-coastal countries and the relative roles and responsabilities of these two groups of countries in the management of highly migratory species.

C. REGIONAL REVIEWS OF INLAND WATER RESOURCES

The separate collection and processing of aquaculture and inland fisheries statistics has recently been initiated in the Fisheries Department. While the process of redefining the statistics is not complete the present figures allow for a somewhat better evaluation of the significance of each of these sectors. Analysis of the catches over the last five years shows them to have continued to increase but, although an approximate estimate of inland water catches can be obtained from the subtraction of the aquaculture figures from the total, this is an unreliable process. Difficulties still remain with the interpretation of the different ways in which such statistics are reported as the inclusion of inland statistics under the general heading of aquaculture is still general especially where culture-based fisheries are concerned. It is also evident that much of the catch from inland waters remains unreported due to the fragmentation of the fisheries themselves and the relatively unimportant catches from individual small water bodies or river reaches.

The total production of freshwater and diadromous fishes by continent is shown at the bottom of Table 20. This indicates a steady growth of the whole inland fisheries sector throughout the period under review of about 34 percent. In Asia production grew by 45 percent with a growth of 13 percent in Europe and 20 percent in Africa. Production in Oceania increased by 6 percent, North America grew by 23 percent and South America by 5 percent. Expansion in the USSR was 12 percent.

Table 20 also presents aquaculture and inland capture production respectively, indicating the major origins of the increases. In the five years from 1984 to 1988 global aquaculture production from inland waters has increased by some 63 percent. Growth of the sector continued to be strong in Asia (71 percent) and lesser increases were recorded in Europe (19 percent), North America (27 percent) and USSR (34 percent). The high figure for Asiatic aquaculture dominates the totals and continues to contribute 85 percent of the total world production in 1988.

Capture fisheries have remained relatively static throughout the five year period with no increase Europe and Oceania and slight increases registered in South America (4 percent), Asia (13 percent), USSR (2 percent), Africa (18 percent), and North America (20 percent). This confirms a general trend for inland capture fisheries to decline especially in the industrialized countries and their previous production to be substituted by aquaculture. The percentage of aquaculture production to total production has increased from 43.1 to 52.2 by 1988. Reasons for the only slight increase in capture fisheries include degradation of stocks through environmental pressure but are also socioeconomic in origin in that inland fish resources tend to be used more for recreation and subsistence and catches from such fisheries are rarely recorded in the official statistics.

AFRICA (Area 01)

Catches in Africa have been increasing slowly but steadily from 1.3 million tons in the early 1970s to an estimated 1.8 million tons in 1988. Theoretical calculations have estimated a much higher potential fish yield from the inland waters of the continent, however much of the unrealized potential is in waters which are relatively inaccessible and far from markets (Congo/Zaire, Okavango, etc.). Growth in the aquaculture sector has been rapid on a percentage basis having nearly doubled in five years, but still represents a minimal part of total African production (4 percent).

There was a serious depletion of fish stocks in many parts of Africa due to change in the climate. This has been particularly marked in the Sahelian zone where Chad, Niger, Mali and Senegal have been the most affected with the virtual cessation of the floods of the Niger, Senegal, Logone and Chari Rivers and with the continued desiccation of Lake Chad. Better rainfall in 1985 and 1986 produced some recovery which is continuing, for example Lake Volta is near bankfull. Continued improved rains in the Nile drainage and the Sahel should benefit floodplain river resources and those of the Nile, Niger and Senegal reservoirs as well as other smaller fisheries.

The other significant changes in capture fisheries have resulted from some species transfers. The introduction of Nile perch (Lates niloticus) into Lake Kyoga in Uganda has resulted in the conversion of this previously highly productive multi-species fishery into one based upon three species only, with a resulting long-term drop in catch. The fisheries of Lake Victoria appear to be following a similar history, where the introduced predator is increasingly dominating the catch but is still increasing as part of the early phase of predatory expansion. The history of Lake Kivu following the transfer of Limnothrissa miodon from Lake Tanganyika has resulted in the creation of a new fishery of modest but increasing yield. Lake Kariba has had a successful fishery for this species for some time and a similar fishery could be developed downstream in Cabora Bassa Lake.

A continent-wide trend is a focus on small water bodies for natural and culture-based fisheries.

NORTH AMERICA (Area 02)

Total production from North America has increased by about 23 percent over the five years under review. Capture fisheries have remainded relatively stable, recording minor decreases in production in both 1986 and 1988. Aquaculture has recorded modest increases for most of the years listed and is approaching 50 percent of the total production. Much of this is the result of growing utilization of small dams in Mexico for culture.

SOUTH AMERICA (Area 03)

Catches from the inland waters of Latin America continue to increase at a slow rate (4 percent), mainly by the opening up of new fisheries on the Amazon and Orinoco rivers. There are, however, signs of decline in the fisheries of the Magdalena and in regions of the Amazon close to urban centres. Furthermore, environmental degradation is becoming a problem in some areas. By contrast the aquaculture sector has expanded by 50 percent during the same period although only 5 percent of total inland production comes from this source. Total aquaculture production increases are mainly due to the rapid expansion of shrimp culture in Ecuador and Colombia and more modest progress with salmonid culture in Chile.

ASIA AND THE PACIFIC (Areas 04 and 06)

Asia continues to produce the majority of fish of freshwater origin, about 67.8 percent of the world total (1988). Production from inland capture fisheries approximated 3.0 million t, and 5.6 million t of freshwater finfish from aquaculture. In the freshwater group various carp species predominated, with 79.0 percent of the total fish grown; together with tilapias the ratio of relatively cheap food fishes reached 83.0 percent. China continued by far as the major producer of freshwater fish, followed by India, Vietnam, Indonesia and Bangladesh. Considerable improvement was registered all over the region in seed supply of freshwater fish species and also of cultured freshwater prawn and marine shrimp species. Besides large-scale hatcheries of the public and private sector, medium and small-scale fish and crustacean hatcheries emerged in high numbers in several countries of Asia, e.g. in Thailand and the Philippines, contributing significantly to the availability of fish, shrimp and prawn seed at reasonable prices.

Spread of fish/shrimp diseases has become a major threat to aquaculture. The epizootic ulcerative disease of freshwater fish reached Sri Lanka, the Philippines, Bangladesh, India, Bhutan and Nepal, causing severe mortalities not only in fish ponds but in natural waters too. The disease raised serious public concern in the affected countries disrupting traditional fish distribution and consumption patterns. Unfortunately, there was little progress in understanding the transmission of the disease and the arresting of its further spread.

Marketing constraints are emerging increasingly as major problems in the further development of aquaculture. Domestic marketing difficulties for freshwater fish have been observed in Indonesia, Malaysia and the Philippines. Marketing more value-added products on the export markets, improvement of the internal marketing systems and promotion of domestic fish consumption were proposed to overcome marketing problems.

Despite the emerging constraints discussed above, aquaculture proved to be the most rapidly expanding food production branch in the region. While between 1978 and 1988 the average annual growth rate of cereal production was 2.8 percent in Asia and the Pacific, aquaculture demonstrated an average of 8.3 percent annual growth between 1984 and 1988, years for which data are available. Such a rapid growth may not be sustainable considering the evolving marketing constraints.

In capture fisheries, increased production has been recorded for reservoirs and lakes practising culture-based fisheries. Fish yield predictive models are being evolved which will allow better approximations to be made about the carrying capacities of lakes and reservoirs in the region. However, the rapidly increasing rivershed manipulation, damming of rivers and uncontrolled pollution remain the major constraints for increasing fishery yields from capture fisheries. Projects aimed at rehabilitation of fish stocks and fisheries in natural water bodies are on the increase throughout the region and more attention is being paid to maintaining fishery sustainability in such waters.

EUROPE AND USSR (Areas 05 and 07)

Total production from the inland waters of Europe increased by about 13 percent from 1984 to 1988. Catches from capture fisheries remained unchanged, although almost certainly, there was a considerable tonnage caught by the generally unrecorded recreational fisheries. The whole of the recorded increase, therefore, arose through a growth in the aquaculture sector of some 19 percent and culture fisheries now contributes 72 percent of European catch. Production from the USSR increased by 12 percent. Catches of freshwater and diadromous fishes increased only by 2 percent against an expansion in aquaculture by 34 percent.

AQUACULTURE PRODUCTION BY CATEGORY (Table 21)

Production by category from freshwater, brackish and marine aquaculture is listed in Table 21 which indicates an overall increase in production of some 64 percent for the period under review.

The range of organisms cultured is not large with Asiatic carps still making up about 58 percent of total finfish culture. Production of high value items such as shrimps and salmonids continues to increase. All shrimp culture has increased over the period: inland 757 percent; marine 185 percent; brackish 216 percent; for a total quantity of 511,454 t. Salmon marine culture produced 208,215 t by 1988 while salmonids in fresh and brackish waters reached 250,918 t.

Total aquaculture production is now 10.8 million t (excluding aquatic plants) with inland production comprising 58 percent of this amount, an almost constant proportion over the period.

The culture of plants, listed separately in Table 21, increased by 5.5 percent.

Table 1

Annual world landings of aquatic resources (million tons)
(excluding mammals and seaweeds)

	1948-52	1953-57	1958-62	1963-67	1968-72	1973-77	1978-82	1983	1984	1985	1986	1987	1988
Total: All species	**21.9**	**29.0**	**39.8**	**53.9**	**67.1**	**66.0**	**72.9**	**77.4**	**83.8**	**86.3**	**92.6**	**94.0**	**98.3**
Inland waters	2.5	3.8	5.8	7.3	8.9	6.8	7.7	9.2	10.0	10.7	11.8	12.7	13.4
Anchoveta	0.0	0.1	3.7	9.0	10.0	2.8	1.4	0.1	0.1	1.0	4.9	2.1	3.6
Marine: less anchoveta	19.4	25.1	30.3	37.6	48.2	56.4	63.8	68.1	73.7	74.6	75.8	79.2	81.3

Source: 1948-87: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.
1988: Provisional FISHDAB.

Table 2

Catches ('000 tons) by local and long-range fleets in selected regions in which fishing by countries outside the region is particularly important

Area	1970–74		1975–79		1980–84		1985		1986		1987		1988	
	Local	Long Range	Local	Long Range	Local	Long Range	Local	Long Range	Local	Long Range	Local	Long Range	Local	Long Range
NW Atlantic	**2014.5**	**2209.6**	**2125.6**	**1042.0**	**2496.7**	**293.1**	**2502.3**	**367.7**	**2473.1**	**479.1**	**2607.9**	**484.9**	**2652.4**	**391.7**
% of total area catch	47.7	52.3	67.1	32.9	89.5	10.5	87.2	12.8	83.8	16.2	84.3	15.7	87.1	12.9
EC Atlantic	**973.5**	**1962.5**	**1076.6**	**2102.7**	**1292.3**	**1753.8**	**1458.9**	**1386.0**	**1626.0**	**1402.4**	**1575.3**	**1653.4**	**1607.0**	**1950.2**
% of total area catch	33.2	66.8	33.9	42.4	42.4	57.6	51.3	48.7	53.7	46.3	48.8	51.2	45.2	54.8
SE Atlantic	**1701.5**	**1053.8**	**1231.9**	**1545.9**	**937.9**	**1044.6**	**844.7**	**1252.9**	**872.2**	**1244.9**	**1502.9**	**1200.9**	**1395.7**	**1061.9**
% of total area catch	61.8	38.2	44.2	55.7	41.1	58.9	40.3	59.7	41.2	58.8	55.6	44.4	56.8	43.2
NE Pacific	**509.6**	**1882.3**	**653.0**	**1407.3**	**1087.7**	**1234.4**	**1828.8**	**1053.3**	**2255.1**	**949.8**	**2818.9**	**628.5**	**3072.1**	**266.1**
% of total area catch	21.3	78.7	31.7	68.3	46.8	53.2	63.5	36.5	70.4	29.6	81.8	18.2	92.0	8.0

Source: 1970–87: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.
1988: Provisional FISHDAB.

Table 3

Northwest Atlantic (Area 21)

Stock a/	Main fishing countries (1988)	Catches ('000 t) 1970 -74	1975 -79	1980 - 84	1985	1986	1987	1988	State of Exploitation
Atlantic cod	Canada, Greenland, USA, Spain, France, Portugal	972	538	654	640	657	610	643	Fully to overexploited
Red hake	USA, USSR	45	15	3	2	2	3	2	Depleted
Haddock	Canada, USA	34	42	67	50	54	35	36	Depleted
Saithe (=Pollock)	Canada, USA	34	43	54	66	78	76	62	Fully exploited
Silver hake	USSR, USA, Cuba	270	136	71	99	103	78	91	Under exploited
Roundnose grenadier	Germany, USSR, Portugal	42	24	5	5	7	8	7	Moderately exploited
Atlantic redfishes	Canada, USSR, Portugal	267	165	123	128	166	209	148	Fully to overexploited
Flatfishes	Canada, USA, Spain	284	238	212	205	217	221	184	Fully exploited or depleted
Other groundfish	USA, Canada, USSR, Spain	137	118	94	97	110	123	97	
Capelin	Canada, USSR	130	217	42	54	84	66	110	Recovering
Atlantic herring	Canada, USA	612	320	199	220	223	287	284	Recovering
Atlantic menhaden	USA	273	267	313	312	223	297	327	Fully exploited
Atlantic mackerel	Canada, Germany DM.RP, USA, Netherland, Poland	355	133	29	55	64	74	79	Underexploited
Other fish	USA, Canada, USSR	140	92	59	69	57	80	51	
Total fish		**3595**	**2348**	**1925**	**2002**	**2045**	**2167**	**2121**	
Crabs	USA, Canada	46	50	95	99	94	80	87	Most stocks fully exploited
American lobster	Canada, USA	30	33	43	54	59	60	63	Fully exploited
Northern prawn	Greenland	12	42	46	53	65	63	64	Fully exploited
Other shrimp	Canada	13	8	11	17	15	25	30	Fully exploited
Total crustaceans		**101**	**133**	**195**	**223**	**233**	**228**	**244**	

Table 3 (continued)

Northwest Atlantic (Area 21)

Stock a/	Main fishing countries (1988)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of Exploitation
	American cupped oyster USA, Canada	173	146	118	53	72	59	38	Environmental impacts
Scallops	USA, Canada	73	182	152	108	129	190	192	Fully exploited
Clams (soft shell, quahogs)	USA, Canada	231	232	325	435	418	395	382	Fully exploited
Squids	USA	45	117	58	23	23	24	22	Environmental impacts
Other molluscs	USA	5	8	16	25	31	28	42	
Total molluscs		**527**	**685**	**669**	**644**	**673**	**696**	**676**	
Others	USA	**1**	**1**	**1**	**1**	**1**	**2**	**3**	
Total area		**4224**	**3167**	**2790**	**2870**	**2952**	**3093**	**3044**	

Source: 1970-87 Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.
1988: Provisional FISHDAB

Note: The main fishing countries are listed in ranking order by catch size.

a/ Part of stock occupies Western Central Atlantic (Area 31)

Management measures. All important stocks in canadian, NAFO and the northen areas are covered by catch quotas. These quotas are set by coastal states (Canada, and the European Economic Community) for waters within 200 miles and by the North Atlantic Fisheries Organization (NAFO) for waters beyond national jurisdiction. In addition to quotas, there are controls on effort, gear, area and season for various fisheries.

Table 4

Northeast Atlantic (Area 27)

Stock	Main fishing countries (1988)	Estimated potential ('000 t)[a/]	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Freshwater and diadromous	Norway, UK, Scotland, Finland,	Unknown	56	49	66	92	117	124	172	Unknown
Plaice	Netherlands, Denmark, UK England Wales	150	184	167	147	203	182	185	192	Fully exploited
Common sole	Netherlands, France	20-25	31	23	29	34	28	30	28	Fully exploited
Other flatfish	Iceland, Spain, France	150	159	127	147	143	141	156	171	Fully exploited
Tusk	Norway	Unknown	32	34	42	44	44	41	34	Unknown
Atlantic cod	Iceland, Norway, USSR, Denmark	1500-2000	1831	1714	1527	1313	1371	1468	1328	Fully exploited
Lings	Norway, France, Faeroe is., Spain	Unknown	68	73	84	87	85	85	85	Unknown
Haddock	UK Scotland, Norway, Iceland, USSR	400	601	385	312	327	364	363	302	Fully exploited
Saithe (Pollock)	Norway, Iceland, France Faeroe is.	700	646	537	439	439	388	409	385	Fully exploited
Polar cod	USSR	Unknown	193	18	29	11	1	0	0	Unknown
Norway pout	Denmark, Norway, Faeroe is.	Unknown	523	541	500	391	235	339	276	Unknown
Blue whiting (Poutassou)	Norway, USSR, Denmark, Faeroe is.	Unknown	41	410	729	651	804	693	654	Moderately to fully exploited

Table 4 (continued)

Northeast Atlantic (Area 27)

Stock	Main fishing countries (1988)	Estimated potential ('000 t)[a/]	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Whiting	UK Scotland, France, Denmark	200-300	204	220	178	134	113	118	118	Fully exploited
European hake	Spain, France, UK England Wales, Portugal	100-150	97	76	66	77	72	72	74	Fully exploited
Other gadoids	France, USSR, Spain	Unknown	42	52	53	45	67	59	53	Unknown
Sandeels	Denmark, Norway, UK Scotland	500	358	643	681	657	973	857	1042	Fully exploited
Atlantic redfishes	Iceland, USSR, Norway	250-500	155	312	292	276	259	214	229	Fully exploited
Monk (Angler fish)	France, Spain, UK Scotland	Unknown	35	37	53	60	52	54	56	Unknown
Other demersal fish	Denmark, Norway, Iceland, France, Faeroe is.	Unknown	145	155	119	111	139	188	190	Unknown
Capelin	Iceland, Norway, Faeroe is.	2000	1668	2921	2426	2132	1292	1022	1032	Fully exploited
Atlantic horse mackerel	Denmark, Netherlands, Spain, Norway	Unknown	279	234	169	202	229	261	356	Moderately exploited
Atlantic herring	Norway, Denmark, Sweden, USSR, Iceland, Finland, UK Scotland, Netherlands	2000-2500	1373	784	849	1305	1318	1305	1394	Some stocks depleted others fully exploited
European sardine (pilchard)	Portugal, Spain	400	161	164	217	220	199	182	189	Moderately exploited

Table 4 (continued)

Stock	Main fishing countries (1988)	Estimated potential ('000 t)[a/]	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Sprat	Denmark, USSR, Poland	500-1000	402	748	426	214	202	246	257	Fully exploited
European anchovy	Spain, France	Unknown	35	47	17	13	11	18	19	exploited
Atlantic mackerel	UK Scotland, Norway Ireland, Netherlands	500	482	724	589	540	537	616	618	Fully exploited
Tunas	Spain, Portugal	50	53	49	46	44	53	57	64	Fully exploited
Other pelagic fish	Portugal, Spain	Unknown	44	53	26	57	44	27	21	Unknown
Sharks	France, Ireland, UK Scotland	Unknown	71	64	56	68	65	70	67	Unknown
Skates	France, UK Scotland UK England Wales	Unknown	31	27	27	23	25	30	28	Some species depleted
Other fishes	Portugal, USSR, Spain, France	Unknown	225	183	171	101	69	41	64	Unknown
Total fishes			**10226**	**11571**	**10512**	**10014**	**9529**	**9330**	**9498**	
Crabs	France, UK England Wales	Unknown	25	33	35	38	34	38	36	Unknown
Norway lobster	UK Scotland, France	50	36	40	46	55	51	54	56	Fully exploited
Northern prawn	Norway, Iceland	25-50	21	33	85	140	117	113	99	Fully exploited
Common shrimp + crangon	Germany FR, USSR	50	40	38	46	52	30	28	32	Fully exploited
Other crustaceans	Denmark, France	Unknown	16	8	6	12	7	7	8	Unknown
Total crustaceans			**138**	**152**	**218**	**297**	**239**	**240**	**231**	

Table 4 (continued)

Stock	Main fishing countries (1988)	Estimated potential ('000 t)[a/]	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Oysters	France	100 b/	70	99	103	142	146	135	136	Fully exploited
Blue mussel	Spain, Netherlands Denmark, France	Unknown b/	293	328	479	539	532	496	464	Moderately exploited
Scallops	Norway, Iceland, UK Scotland	50	41	44	49	50	61	39	62	Fully exploited
Common cockle	UK England Wales, Portugal	Unknown b/	30	28	17	10	27	46	32	Moderately exploited
Cephalopods	France, Portugal Spain	1000	36	25	39	38	25	44	47	Virtually unexploited
Other molluscs	Portugal, France, UK England Wales	Unknown	41	32	27	23	30	41	39	Unknown
Total molluscs			511	556	714	802	821	851	780	
Others c/			4	2	0	0	0	0	0	
Total area			10879	12281	11444	11113	10589	10421	10509	

Source: 1970-87 Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.
1988: Provisional FISHDAB

Note: The main fishing countries are listed in ranking order by catch size.

a/ Values are only indicative
b/ Aquaculture important
c/ Including starfish, purple sea urchin and aquatic invertebrates n.e.i

Management measures. The management regime of this region is in a period of transition, with the establishment of entailed jurisdiction by the coastal state, and the slow development of a common fishery policy by the EEC. A variety of measures, principally catch quotas, and controls on mesh sizes and sizes of fish have been set.

Table 5

Western Central Atlantic (Area 31)

Stock	Main fishing countries (1988)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Freshwater and diadromous fishes	Venezuela	10	7	10	16	10	12	11	Fully exploited
Snappers	Mexico, Cuba, Venezuela, USA	21	19	22	22	24	26	23	Uneven, some stocks fully exploited
Groupers	Mexico, USA	24	21	26	22	22	24	26	
Grunts	Venezuela, Cuba	29	23	8	9	8	9	7	Heavily exploited
Sciaenids	Venezuela, USA, Mexico	37	39	31	30	31	29	28	
Sharks and rays	Mexico, Venezuela, USA	9	12	21	25	24	25	30	Moderately exploited
Other demersal fishes	Mexico, Venezuela, USA, Dominican Rep.	36	38	51	32	28	33	34	Heavily exploited
Mullets	USA, Mexico, Venezuela	27	23	31	24	27	31	31	Uncertain a/
Atlantic menhaden	USA	51	80	83	47	34	26	34	Fully exploited
Gulf menhaden	USA	571	636	803	884	829	907	639	Fully exploited
Round Sardinella	Venezuela	44	40	50	59	84	87	62	Moderately exploited
Other clupeoids	Cuba, USA	20	15	11	10	6	5	6	Moderately exploited
King and Spanish mackerels	Mexico, USA, Venezuela	21	22	23	19	20	22	19	Moderately to fully exploited
Other Tuna	Venezuela, USA	32	35	58	75	55	54	57	Larger species Moderately exploited
Other pelagic fish	Venezuela, Barbados, USA, Mexico	22	25	27	25	24	25	33	Moderately exploited

Table 5 (continued)

Stock	Main fishing countries (1988)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Unidentified fishes	Mexico, USA, Guyana, Cuba	129	157	244	275	282	264	266	
Total fish		**1083**	**1192**	**1499**	**1574**	**1508**	**1579**	**1306**	
Crabs	USA, Mexico	35	41	49	51	51	56	65	Lightly exploited
Spiny lobsters	Cuba, Bahamas	20	22	24	30	28	26	25	Most stocks fully or over-exploited
Shrimps	USA, Mexico	170	166	171	182	200	179	163	
Other crustaceans	Cuba, Guadalupe	1	1	0	0	0	2	1	
Total crustaceans		**226**	**230**	**244**	**263**	**279**	**263**	**254**	
Oysters	USA, Mexico	161	172	206	223	186	173	158	Large potential for culture
Cephalopods	Mexico, Venezuela	5	7	10	10	13	12	12	Lightly unexploited
Calico scallop	USA	9	14	150	126	17	85	122	Moderately-fully exploited
Other molluscs	Venezuela, USA	17	33	38	54	41	48	43	Lightly exploited
Total molluscs		**192**	**226**	**404**	**413**	**257**	**318**	**335**	
Others		**1**	**1**	**1**	**2**	**1**	**1**	**1**	
Total area		**1502**	**1649**	**2148**	**2252**	**2047**	**2161**	**1896**	

Source: 1970-87: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.
1988: Provisional FISHDAB.

Note: The main fishing countries are listed in ranking order by catch size.

a/ Probably moderately to heavily fished if the discards by shrimp trawlers are taken into account

Table 6

Eastern Central Atlantic (CECAF - Area 34)

CECAF Sub-areas	Stock	Main fishing countries (1986)	Estimated potential ('000 t)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	a/ 1987	a/ 1988	State of exploitation
Total North				**2334**	**2207**	**1824**	**1051**	**1136**	...	...	
NORTH											
All sub-areas	Cephalopods			173	177	173	148	158	...	...	Overexploited
34.1.1, 34.1.3	Octopus	Morocco, Spain,	100-135	95	79	78	46	42	...	...	Grossly overexploited
34.1.3, 34.3.1	Cuttlefish	Spain, Senegal, Italy	30-40	31	25	24	14	10	...	...	Overexploited
34.1.1, 34.1.3	Squids	Italy, Spain	20-40	23	16	10	2	2	...	...	Overexploited
34.1.1, 34.1.3	European Pilchard	Morocco, Spain, Romania	1000 (variable)	392	630	434	299	320	...	...	Possibly fully exploited
34.1.3, 34.3.1	Sardinellas	Senegal, Guinea Romania	600 (variable)	169	173	155	144	153	...	...	Intensively exploited, locally overfished
34.3.1	Bonga	Senegal, Gambia	?	27	17	16	12	13	...	...	Unknown
34.1.3, 34.3.1	Horse mackerels	Romania, Germany DM DR, Senegal	400 (variable)	301	317	260	45	58	...	...	Possibly fully exploited (highly variable)
34.1.3, 34.3.1	Mackerels	Romania, Senegal	100	87	82	83	6	12	...	...	Fully exploited (highly variable)

Table 6 (continued)

CECAF Sub-areas	Stock	Main fishing countries (1986)	Estimated potential ('000 t)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	a/ 1987	a/ 1988	State of exploitation
34.1.1	Hakes	Morocco, Spain	6-12	10	20	6	7	6	...	...	Grossly overexploited
34.1.3, 34.3.1	Hakes	Spain	?	41	39	22	2	3	...	...	Assessments unreliable large variability
34.1.3, 34.3.1	Sea breams	Senegal, Italy Portugal	150(?)	91	53	32	22	23	...	...	Probably overexploited
Total South				**540**	**669**	**741**	**584**	**629**	...	...	
SOUTH											
34.3.3/34.3.4/ 34.3.5/34.3.6	All prawn and shrimp	Cameroon, Nigeria Gabon	15	4	11	19	18	18	...	...	Close to full exploitation
All sub-areas	Demersal		68-85	158	207	223	124	139	...	...	Fully exploited
34.3.4	Sardinellas	Ghana, Côte d'Ivoire	60 (variable)	57	55	66	135	111	...	...	Round sardinella recovering; fully exploited (risk of periodical over-fishing)
34.3.6	Sardinellas	Congo, Zaire	Unknown	6	6	11	10	12	...	...	Probably moderately exploited
All sub-areas	Bonga	Nigeria, Sierra Leone, Cameroon, Côte d'Ivoire	Unknown	44	51	99	95	84	...	...	Intensively exploited; stock collapse in Ivory Coast
Total Oceanic				**56**	**62**	**120**	**14**	**13**	...	...	

Table 6 (continued)

CECAF Sub-areas	Stock	Main fishing countries (1986)	Estimated potential ('000 t)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	a/ 1987	a/ 1988	State of exploitation
OCEANIC 34.1.2/34.2.0/ 34.3.2/34.4.1/ 34.4.2											
TUNA 34.0 b/		Spain, Ghana France, Japan	200	258	309	274	239	...	...	Moderately to heavily exploited	
UNKNOWN AREA 34.9.0				120	187	927	1019	...	...		
Total CECAF area				**3314**	**3181**	**2850**	**3036**	**3229**	**3557**		

Source: 1970-86: CECAF Statistical Bulletins;
1987: Yearbook of Fishery (Catches and landings), Vol. 66, FAO, Rome
1988: Provisional FISHDAB

Note: The main fishing countries are listed in ranking order by catch size.

a/ Breakdown by sub-areas for these two years not yet available

b/ Catches in whole areas; see also Table 19

Table 7

Mediterranean and Black Sea (Area 37)

Sector a/	Species Groups	Coastal countries	Remarks	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988 b/
Balearic	Demersal	Algeria	Trawl only	26.9	37.0	43.5	44.2	44.7	43.9	...
37.1.1	Coastal pel.	Morocco		93.2	132.4	154.2	146.1	155.6	121.9	...
	Miscel.c/	Spain		10.2	22.7	29.0	22.7	22.2	15.4	...
Gulf of Lions	Demersal		Finfish (shelf)	4.1	7.2	8.9	5.5	5.9	8.5	...
37.1.2	Coastal pel.	France	Sardine	19.7	18.5	25.5	23.9	21.3	42.5	...
	Miscel.c/			9.4	4.8	3.7	4.2	3.9	7.6	...
Sardinia	Demersal	France	Trawl only	33.3	22.8	23.5	31.1	29.2	32.9	...
37.1.3	Coastal pel.	Italy (W)		58.8	39.1	36.9	35.8	36.6	29.9	...
	Miscel.c/	Tunisia (N)		15.1	12.4	13.1	16.4	15.1	15.8	...
Adriatic	Demersal	Italy (E)	Trawl only	18.2	19.6	18.7	16.2	18.6	20.6	...
37.2.1	Coastal pel.	Yugoslavia		80.2	91.7	122.4	119.8	93.7	92.4	...
	Miscel.c/			30.6	37.2	33.5	23.6	29.8	14.0	
Ionian	Demersal	Albania,	Trawl only	30.8	42.2	49.0	86.4	72.5	64.3	...
37.2.2	coastal pel.	Italy (S), Libya		32.2	43.8	50.4	56.1	62.2	57.7	...
	Miscel.c/	Malta, Tunisia (E)		16.3	37.2	42.5	44.7	45.8	45.4	...
Aegean	Demersal			16.3	22.2	26.9	32.3	39.0	38.6	...
37.3.1	Coastal pel.	Greece (E)		23.2	35.8	46.4	61.5	58.7	65.0	...
	Miscel.c/	Turkey (W)		7.5	10.2	9.2	7.7	8.2	8.1	...
Levant	Demersal	Cyprus, Egypt	Finfish	9.7	12.0	13.2	12.1	14.3	15.8	...
37.3.2	Coastal pel.	Israel, Lebanon		9.1	9.0	13.8	15.7	19.6	21.0	...
	Miscel.c/	Syria, Turkey		4.1	3.1	3.7	6.0	5.3	5.6	...
Whole	Demersal			139.3	163.0	183.7	227.8	224.2	224.6	...
Mediterranean	Coastal pel.			316.4	370.3	449.6	458.9	447.7	430.4	...
	Miscel.c/			93.2	127.6	134.8	125.3	130.3	111.9	...
	Total			548.9	660.9	767.4	812.0	802.2	766.9	...

Table 7 (continued)

Sector a/	Species Groups	Coastal countries	Remarks	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988 b/
Black Sea 37.4	Demersal	Bulgaria, Romania		24.4	31.8	42.3	49.9	48.6	57.4	...
	Coastal pel.	Turkey		293.9	369.0	682.8	655.1	740.2	628.5	...
	Miscel.c/	USSR		98.6	73.1	99.2	135.9	104.9	105.3	...
	Total			**416.9**	**473.9**	**824.3**	**840.9**	**893.7**	**791.2**	...
Whole Area 37.0	Tunas			22.9	30.1	53.5	60.8	53.3	57.8	...
Whole Area 37.0	Others d/			125.8	165.7	226.6	258.1	263.2	293.6	...
Total Area	Demersal			163.7	194.8	226.0	227.7	272.8	282.0	...
	Coastal pel.			610.3	739.3	1132.4	1114.0	1187.9	1058.9	...
	Miscel.			191.8	200.7	234.0	261.2	235.2	217.2	...
	Tunas			22.9	30.1	53.5	60.8	53.3	57.8	...
	Others			125.8	165.7	226.6	258.1	263.2	293.6	...
	Total			**1114.5**	**1330.6**	**1872.5**	**1971.8**	**2021.4**	**1909.5**	**2010.8**

Source: 1970-1987: GFCM Statistical Bulletins
1988: Provisional FISHDAB

a/ GFCM statistical divisions (boundaries given in GFCM Statistical Bulletins)

b/ Breakdown by sub-areas not available

c/ Miscellaneous: diadromous plus marine fishes n.e.i.

d/ Others: crustaceans plus molluscs plus other aquatic animals

Table 8

Southwest Atlantic (Area 41)

Stock	Main fishing countries (1988)	Estimated potential ('000 t)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Argentine hake	Argentina, Uruguay, Spain, Japan	400-600	144	318	329	372	378	431	436	Fully exploited
Southern blue whiting	USSR, Poland		0	11	131	95	104	85	101	Lightly to moderately exploited
Atlantic croaker	Brazil, Uruguay, Argentina	-	54	84	80	57	70	71	74	Moderately to fully exploited
Weakfishes	Brazil, Argentina, Uruguay	-	40	56	77	69	66	69	65	Moderately to fully exploited
Sardinella	Brazil	100-200	174	136	127	124	126	92	65	Fully exploited
Anchoita	Argentina	1000	28	20	18	12	16	20	21	Virtually unexploited
Red shrimp	Argentina	not known	0	0	11	10	7	2	18	Fully to heavily exploited
Other prawns and shrimps	Brazil	60	48	54	52	69	57	57	59	Most stocks fully to heavily exploited
Squids and octopuses	Japan, korea Rep., USSR, Poland Spain	few 100s	4	44	150	270	354	744	691	Patagonian shelf: fully to heavily exploited Elsewhere: lightly expl.
Other demersal Patagonian Shelf stocks.	USSR, Bulgaria Argentina, Poland	Few 100s	2	11	24	44	74	96	131	Moderately exploited
Total area			**818**	**1067**	**1359**	**1567**	**1696**	**2166**	**2228**	

Source: 1970-1987: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.
1988: Provisional FISHDAB

Note: The main fishing countries are listed in ranking order by catch size.

Table 9

Southeast Atlantic (Area 47)

Species	Stocks ICSEAF divisions	Major fishing countries (1988)	Estimated potential ('000 t)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Hakes	1.3+1.4	USSR, Spain	340	414	280	162	212	231	136	212	Overexploited
	1.5	Spain, Sth. Africa, USSR	210	231	162	116	173	150	163	97	Overexploited
	1.6	Sth. Africa	160	164	106	89	100	109	104	90	Recently overexploited Probably recovering
	2.1+2.2	Sth. Africa	65	55	53	43	56	51	41	45	Biomass coming back to the level of maximum average yield
Kingklip	All sub-areas	Sth. Africa, Spain, Japan	20(?)	12	10	8	16	17	14	9	Probably overexploited
Large-eyed dentex	1.3+1.4	Romania	Few 10s(?)	15	23	6	1	1	0	1	Collapsed in mid 1970s, no clear sign of recovery
Panga a/	1.6+2.1+2.2	Japan, Sth. Africa	8	8	6	2	2	2	2	2	Fully exploited
Sardinella a/	1.1+1.2+1.3	USSR, Angola	Few 100s(?)	92	125	205	211	165	108	133	Moderately exploited
Cunene	1.1+1.2	USSR, Angola	variable	...	31	45	28	53	54	39	
Horse mackerel	1.3	USSR, Angola	500 or more with recent high recruitments b/	159	190	60	28	55	51	91	Intensively exploited
Cape horse mackerel a/	1.3+1.4+1.5	USSR, Sth. Africa Romania, Bulgaria, Germany Dem of, Spain	few 100s but variable	161	386	283	428	448	518	539	Probably moderately to fully exploited

Table 9 (continued)

Species	Stocks ICSEAF divisions	Major fishing countries (1988)	Estimated potential ('000 t)	Catches ('000 t) 1970–74	1975–79	1980–84	1985	1986	1987	1988	State of exploitation
	1.6+2.1+2.2 +2.0	Sth. Africa Japan	Varying, 100(?)	32	52	17	27	32	39	41	Moderately to highly exploited
Pilchard	1.3+1.4+1.5	Sth. Africa Romania	About 600 before collapse, around 100s at present	462	279	47	57	53	67	66	Severely depleted with no clear sign of recovery
	1.6	Sth. Africa	Varying b/ around 100	68	85	44	33	36	41	42	Depleted
Anchovy a/	1.3+1.4+1.5	Sth. Africa, Romania	Variable, few 100s	211	212	190	52	16	376	118	Fully to heavily exploited
	1.6	Sth. Africa	150–350	233	244	315	273	300	593	565	Fully exploited
Chub mackerel	1.1+1.2+ 1.3+1.4+1.5	USSR Spain	Unknown	3	77	33	28	28	31	11	Probably intensively exploited
	1.6+2.1+2.2	Sth. Africa Japan	Varying b/ around 50(?)	58	22	3	4	3	5	8	Fully exploited or depleted
Total area				**2755**	**2778**	**2283**	**2098**	**2177**	**2704**	**2458**	

Source: 1970–74: Information provided in FAO Fish. Circ. 710 updated on the basis of reports of December 1979 ICSEAF meeting
1975–88: ICSEAF Bulletins
1970–1987 Total Area production: Yearbooks of Fishery Production (Catches and landings) FAO, Rome.
1988: Provisional FISHDAB

Note: The main fishing countries are listed in ranking order by catch size

a/ Averages 1970–74; 1975–79; 1980–84, not revised

b/ Recruitment and consequently biomass and potential have considerably fluctuated since the outset of the fishery

Table 10

Western Indian Ocean (Area 51)

Stock	Main fishing countries (1988)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Shad (Hilsa)	Pakistan	11	9	4	2	2	2	2	
Giant sea perch	Pakistan	1	1	1	2	1	1	0	
Flat fishes	India	12	10	14	9	15	11	10	
Bombay duck	India	94	122	100	104	95	88	96	
Sea catfishes	India, Pakistan	60	58	52	33	45	45	49	
Lizard fishes	India, USSR	2	8	9	6	6	6	6	
Pike congers	India, Pakistan	9	17	11	11	10	7	6	
Groupers	Saudi Arabia, UAE, Oman	4	4	12	19	20	21	25	Mostly moderately to fairly heavily exploited
False trevally	India	5	3	6	4	5	3	5	
Snappers	Pakistan, Qatar	4	5	7	8	9	10	10	
Ponyfishes	India	16	7	14	12	18	10	9	
Grunts	Pakistan	3	4	4	8	8	8	10	
Emperors (Lethrinids)	UAE, Saudi Arabia, Tanzania, Mauritius	6	12	18	27	34	34	41	
Croakers, drums	India, Pakistan	39	101	111	146	150	152	143	
Goatfishes	India	3	5	9	19	12	9	12	
Porgies, seabreams	Oman, Korea, Pakistan	8	10	14	16	18	21	22	
Threadfins	Yemen AR RP, Tanzania	1	1	1	2	3	2	2	
Other identified demersal percomorphs	India, Tanzania, USSR	14	26	26	20	28	32	41	
Demersal Percomorphs n.e.i.	Madagascar, Sri Lanka	32	44	51	49	49	34	33	
Black pomfret	Pakistan	4	5	3	4	4	1	1	
Butter fishes	India, Pakistan	23	28	36	28	23	25	28	
Carangids	Pakistan, UAE, India, Sri Lanka, Egypt	28	53	59	65	73	83	83	
Sardinellas	India, Pakistan, UAE,	163	237	266	253	243	214	259	Stocks of small pelagic fish

Table 10 (continued)

Stock	Main fishing countries (1988)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Anchovies	India, Pakistan	31	40	53	48	40	34	60	Lightly to moderately exploited
Wolfherrings	India, Pakistan	7	11	16	19	12	12	12	
Mixed clupeoids	India, Pakistan, Sri Lanka	70	60	100	74	80	109	111	
Other identified pelagic percomorphs	Sri Lanka, India, Oman	22	29	41	42	42	46	49	
Pelagic percomorphs n.e.i.	Yemen Dem., Oman	188	143	115	86	79	88	85	
Kingfish or seerfish	Oman, India, Pakistan	22	27	44	76	72	83	77	
Skipjack	Maldives, Spain, France, Sri Lanka	35	28	51	125	136	149	182	
Yellowfin	France, Spain, Oman, Korea Rep., Taiwan (P. China), Sri Lanka	25	28	45	89	106	116	170	
Longtail tuna	Iran, Oman	12	14	12	37	31	37	40	
Kawakawa	India, Oman	2	3	15	22	26	21	32	
Big-eye	Korea, Taiwan (P. China), Japan	12	20	24	31	34	38	41	
Albacore	Taiwan (P. China)	8	8	10	7	16	16	18	
Southern bluefin	Japan	5	3	5	3	2	2	3	
Billfishes	Sri Lanka, Korea, Oman	4	4	5	10	11	11	11	
Other tuna	Pakistan, USSR, India	24	26	25	23	29	37	35	
Hairtails	India	21	37	38	67	59	58	55	
Indian Mackerel (Rastrelliger)	India, USSR,	113	66	49	99	75	77	83	
Sharks, rays	Pakistan, India, Sri Lanka	101	107	97	84	86	89	93	
Other fish	India, Pakistan, Iran, Sri Lanka	250	343	349	540	558	527	533	
Total fish		**1494**	**1767**	**1922**	**2330**	**2361**	**2369**	**2583**	

Table 10 (continued)

Stock	Main fishing countries (1988)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Crabs	Madagascar, Pakistan	0	1	2	2	2	2	2	
Lobsters	Oman, Yemen Dem., Somalia	4	5	3	5	5	5	5	
Shrimps	India, Pakistan, Madagascar Mozambique, Saudi Arabia	200	225	222	259	240	227	237	Mostly fully exploited or overfished
Other crustaceans	India, Sri Lanka	8	16	21	11	10	11	11	
Total crustaceans		**212**	**247**	**248**	**277**	**257**	**245**	**255**	
Cuttle fish	Taiwan (P. China), Yemen Dem., Korea Rep., Oman	10	13	7	9	11	8	7	
Other cephalopods and bivalves	India, Iran, Taiwan (P. China)	3	9	13	21	20	32	34	
Total molluscs		**13**	**22**	**20**	**30**	**31**	**40**	**41**	
Others		**0**	**0**	**0**	**0**	**1**	**0**	**1**	
Total area		**1719**	**2036**	**2190**	**2637**	**2650**	**2654**	**2880**	

Source: 1970-87 Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.
1988: Provisional FISHDAB

Note: The main fishing countries are listed in ranking order by catch size

Table 11

Eastern Indian Ocean (Area 57)

Stock	Main fishing countries (1988)	Catches ('000 t) 1970-74	1975-79	1980-84	1985	1986	1987	1988
Toli Shad	Bangladesh	0	0	11	72	84	94	105
Giant seaperch	Indonesia	1	1	2	4	5	6	6
Flatfishes	India	2	2	3	4	5	5	7
Sea catfishes	India	17	20	29	31	40	34	34
Lizard fish	India, Thailand	2	5	6	6	6	6	6
False trevally	India	3	4	4	2	2	3	3
Sillago-whitings	Australia	1	2	3	3	4	5	5
Ruffs	Australia	5	4	4	6	9	11	11
Snappers	Indonesia	2	4	6	7	7	9	9
Threadfin breams	Thailand, Malaysia, Indonesia	1	5	10	8	10	11	11
Ponyfishes	India, Indonesia	28	34	40	35	32	38	40
Croakers	India, Thailand	21	29	40	42	51	53	55
Goatfishes	India	2	4	5	5	8	9	10
Halfbeaks and needlefish	India	1	9	8	10	11	15	14
Barracudas	India, Indonesia, Thailand	2	3	6	7	7	8	9
Threadfins	India, Indonesia	4	11	8	7	9	10	10
Carangids	Indonesia, India, Thailand	15	26	60	78	81	91	93
Butterfishes	India	6	8	14	11	15	22	11
Sardinella, sardines	India, Thailand, Indonesia	4	66	89	95	115	135	114
Anchovies	India	15	24	36	24	28	26	23
Wolfherrings	India	5	8	11	16	21	18	17
Other Clupeoids	Indonesia, Australia, Malaysia	57	32	69	54	59	68	61
Kingfish, seerfishes	India, Indonesia, Malaysia	10	16	22	21	25	25	43
Skipjack	Indonesia	3	6	11	12	12	13	13
Yellowfin	Indonesia, Japan	5	10	10	12	10	13	13
Bigeye	Taiwan (P.China), Japan, Korea Rep.	4	12	13	12	9	10	9
Albacore	Taiwan (P.China)	3	3	5	2	10	10	11
Southern bluefin	Australia, Japan	21	19	24	25	20	17	15
Marlins, billfishes swordfish	Taiwan (P. China), Japan	2	3	5	6	4	3	2
Other tuna	Indonesia, India, Thailand	8	16	38	42	38	54	56
Hairtails	India, Indonesia	23	31	34	41	36	33	43

Table 11 (continued)

Stock	Main fishing countries (1988)	Catches ('000 t) 1970-74	1975-79	1980-84	1985	1986	1987	1988
Mackerels (Rastrelliger)	India, Indonesia, Malaysia, India, Thailand	15	37	108	124	105	109	115
Sharks and rays	India, Indonesia, Australia	31	38	50	47	53	58	66
Other, identified fish	India, Malaysia, Indonesia, Thailand, Australia	35	60	101	105	121	151	148
Marine fishes n.e.i.	Myanmar, Thailand, Malaysia Bangladesh, India	457	682	917	956	1049	1077	1090
Total fishes		811	1234	1802	1932	2101	2250	2278
Sand and mud crabs	Thailand	0	4	8	8	10	10	10
Lobsters	Australia	12	14	16	17	16	17	17
Penaeid shrimps	Malaysia, Thailand, Indonesia	3	30	67	61	67	67	73
Sergestid shrimps	Malaysia, Thailand,	0	2	11	11	9	9	9
Other crustaceans	India, Bangladesh	29	44	70	83	97	99	143
Total crustaceans		44	94	172	180	199	202	252
Abalones	Australia	6	5	7	7	7	6	6
Oysters and mussels	Thailand, Australia	0	1	6	6	6	9	7
Scallops	Australia	4	4	18	15	12	9	9
Cockles and clams	Malaysia, Indonesia	0	27	109	76	73	75	63
Cuttlefish and squids	India, Thailand, Malaysia	2	12	24	28	33	45	49
Other mulluscs	India, Thailand	0	0	1	2	6	7	4
Total molluscs		12	49	165	134	137	151	138
Jelly fishes	Thailand	0	2	29	25	64	32	32
Total area		867	1379	2168	2271	2501	2635	2700

Source: 1970-87 Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.
1988: Provisional FISHDAB

Note: The main fishing countries are listed in ranking order by catch size

Table 12

Northwest Pacific (Area 61)

Stock	Main fishing countries (1988)	Estimated potential [a] ('000 t)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Salmon	Japan, USSR	300-350	186	230	239	334	250	287	258	Somewhat depleted but recovering
Alaska pollack	USSR, Japan, Poland, Korea Rep.	3000-5000	3014	3564	3618	4733	5154	5009	5107	Fully exploited
Other demersal	Japan, Korea Rep. USSR, China	2800-2900	1683	2072	1830	1999	2213	1994	1807	Most stocks fully exploited or overfished
Pacific saury	Japan, USSR		283	334	235	274	251	227	347	
Japanese jack mackerel	Japan, Korea Rep.		192	116	108	174	122	201	274	
Pacific herring	USSR,		465	248	145	203	249	255	201	
Japanese pilchard	Japan, USSR, Korea Rep.	5800-6500	157	1433	3959	4723	5191	5321	5429	Stocks fished close to maximum, taking into account fishing and natural fluctuations
Japanese anchovy	Japan, Korea Rep.		441	356	349	349	412	308	304	
Chub mackerel	Japan, China, Korea Rep., USSR		1554	1789	1354	1217	1479	1133	1138	
Largehead hairtail	China, Korea Rep.	650-700	673	571	657	636	566	566	531	Fully exploited
Tunas, billfishes [b]	Japan, China Taiwan (P.China)	280-380	384	419	449	422	472	433	509	Most stocks fully exploited

Table 12 (continued)

Stock	Main fishing countries (1988)	Estimated potential ('000 t) a/	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Other small pelagic	Japan, China, Taiwan (P.China)		387	523	758	879	933	1002	910	
Marine fishes n.e.i.	China, Korea Dem. Japan, USSR	3800-3900 c/	2844	3522	3809	3971	4271	4360	4755	
Japanese flying squid	Japan, Korea Rep.	300-400	425	285	267	192	128	243	206	Fully exploited
Total area		19800-21600 d/	**14570**	**17961**	**20734**	**23867**	**25737**	**25871**	**26703**	Nearly fully exploited

Source: 1970-87: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.
1988: Provisional FISHDAB.

Note: The main fishing countries are listed in ranking order by catch size

a/ Generally on a conservative basis

b/ Includes skipjack tuna, larger tunas, smaller tunas and billfishes

c/ Current level

d/ Includes, in addition to the above (1) other cephalopods (650-850); (2) prawn and shrimps (400-600), and (3) others (1750, current level)

Table 13

Northeast Pacific (Area 67)

Stock	Main fishing countries (1988)	Estimated potential ('000 t)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Salmons	USA, Canada	250	197	219	354	435	396	316	334	Fully exploited
Pacific halibut	USA, Canada	38	25	14	19	34	41	42	43	Depleted, recovering
Yellowfin sole	USA	150-180	56	76	86	203	179	183	219	Moderately exploited
Other flatfishes	USA, Canada	210-350	172	112	118	134	166	126	179	Moderately exploited
Pacific cod	USA,	350-380	79	62	112	138	172	208	245	Moderately exploited
Alaska pollack	USA, Korea Rep.	1150-1600	1063	888	1086	1399	1605	1714	1550	Fully exploited
North Pacific hake	USA, Poland	210	169	163	95	99	186	298	199	Moderately exploited
Pacific ocean perch	Canada, USA	210	109	41	26	22	32	34	33	Depleted
Sable fish	USA	50-60	47	28	24	30	40	48	52	Moderately exploited
Pacific herring	USA, Canada	several 100s	114	101	78	83	68	85	84	Local stocks in different states
King crabs	USA	30-50	40	53	32	7	12	13	10	Depleted
Pacific snow crabs	USA	50-80	31	52	39	39	50	52	66	Fully to heavily exploited
Pacific ocean shrimps	USA	Unknown	54	67	22	14	28	32	33	Fully to heavily exploited
Total area			**2392**	**2060**	**2322**	**2882**	**3205**	**3447**	**3338**	

Source: 1970-87: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.
1988: Provisional FISHDAB.

Note: The main fishing countries are listed in ranking order by catch size

Table 14

Western Central Pacific (Area 71)

Stock	Main fishing countries (1988)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Demersal fish	Philippines, Indonesia, Thailand, Malaysia	491	612	613	682	734	756	762	Inshore stocks heavily exploited
Coastal small pelagic fish									
Mackerels (Rastrelliger)	Thailand, Indonesia, Philippines, Malaysia	222	227	255	325	304	305	318	
Round scads	Philippines, Indonesia Thailand	264	343	275	327	357	364	372	Scads and mackerels
Sardinellas	Indonesia, Philippines, Thailand	175	341	392	298	320	341	344	
Anchovies	Philippines, Indonesia Thailand	148	166	209	307	252	264	283	moderately exploited
TOTAL		**809**	**1077**	**1131**	**1257**	**1233**	**1274**	**1317**	
Coastal larger pelagic fish									
King/Spanish mackerels	Indonesia, Philippines Malaysia	55	61	79	72	83	82	88	
Smaller tunas a/	Philippines, Thailand Malaysia	62	94	160	202	193	254	232	Moderately exploited
TOTAL		**117**	**155**	**239**	**274**	**276**	**336**	**320**	

Table 14 (continued)

Stock	Main fishing countries (1988)	Catches ('000 t) 1970-74	1975-79	1980-84	1985	1986	1987	1988	State of exploitation
Skipjack tuna	Indonesia and Philippines	42	70	99	137	151	164	150	Approaching maximum level
	Major Oceanic countries c/	31	48	47	42	44	36	50	
	Non-coastal countries d/	103	156	227	192	346	325	419	
TOTAL		**176**	**274**	**373**	**371**	**541**	**525**	**619**	
Yellowfin tuna	Indonesia and Philippines	48	62	77	94	94	85	92	
	Major Oceanic countries c/	4	8	10	12	5	12	18	(see tuna review)
	Non-coastal countries d/	27	56	99	71	113	164	86	
TOTAL		**79**	**126**	**186**	**177**	**212**	**261**	**196**	
Penaeid shrimps	Thailand, Indonesia, Malaysia, Philippines	195	217	206	173	203	207	273	Most stocks fully or heavily exploited
other shrimps and prawns	Vietnam, Indonesia, Thailand, Philippines	83	135	140	151	153	161	173	
TOTAL		**278**	**352**	**346**	**324**	**356**	**368**	**446**	
Cephalopods b/	Thailand, Philippines Malaysia, Vietnam	95	134	152	159	185	186	187	Only slightly to moderately exploited
Total area		**4471**	**5118**	**5455**	**5885**	**6394**	**6789**	**6883**	

Source: 1970-87: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.
1988: Provisional FISHDAB.

Note: The main fishing countries are listed in ranking order by catch size

a/ Bullet and frigate tunas, kawakawa and longtail tuna. Nominal statistics are incomplete, only a few countries separated these species
b/ Squids, cuttlefish and octopuses
c/ Fiji, Kiribati, Solomon Islands, etc.
d/ Japan, Korea Rep., U.S.A. and Taiwan, Province of China

Table 15

Eastern Central Pacific (Area 77)

Stock	Main fishing countries (1988)	Estimated potential ('000 t)	Catches ('000 t) a/ 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Freshwater and diadromous fishes	USA		2	2	2	2	3	4	6	
Demersal fishes	Mexico, USA	few 100s	79	68	91	71	61	65	70	Lightly exploited
Chub mackerel	USA, Mexico,	few 100s	1	15	38	47	50	47	51	Moderately exploited
Pacific jack mackerel	USA	100-500	19	27	38	10	11	12	10	Lightly exploited
Californian pilchard (=sardine)	Mexico	b/	58	142	353	372	470	477	446	Moderate to fully exploited
North Pacific anchovy	Mexico	500-1000	92	238	280	154	123	167	120	Lightly exploited
Central Pacific anchoveta	Panama	few 100s	37	104	103	224	84	127	39	Moderately to fully exploited
Pacific thread herring	Panama	few 100s	17	19	19	2	45	11	41	Moderately to fully exploited
Other coastal pelagic fishes	Mexico, USA	few 100s	7	12	19	14	12	20	18	Lightly exploited
Skipjack tuna	USA, Japan, Mexico	250	58	119	108	142	64	64	77	Moderately exploited
Northern bluefin tuna	USA		9	8	2	4	5	1	1	Moderately exploited
Albacore	Japan, Taiwan (P.China), Korea Rep.	100-200	15	20	24	33	33	24	25	Moderately exploited
Bigeye tuna	Japan, Korea Rep.		42	70	64	79	101	98	75	Moderately exploited
Yellowfin tuna	Mexico, USA, Venezuela	200-250	170	202	151	238	280	293	292	Fully exploited

Table 15 (continued)

Stock	Main fishing countries (1988)	Estimated potential ('000 t)	Catches ('000 t) a/ 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Other oceanic fish	Japan, Mexico, USA, Korea Rep.,	100-500?	37	34	32	30	33	42	39	Lightly exploited
Unident. fishes	Mexico		119	96	135	1135	242	118	119	
Total fishes			**762**	**1176**	**1439**	**1574**	**1477**	**1570**	**1429**	
Dungeness and Pacific rock crabs	USA	500?	2	1	0	1	1	1	2	Unexploited
Shrimps	Mexico, Costa Rica, Panama	80	68	58	75	81	79	82	72	Fully exploited
Other crustaceans	Mexico, El Salvador, USA		2	3	11	8	13	18	10	
Total crustaceans		600	**72**	**62**	**86**	**90**	**93**	**101**	**84**	
Squids	USA, Japan, Korea Rep.	500-100?	11	14	23	25	36	68	77	Lightly exploited
Other molluscs	Mexico, USA		17	15	25	21	28	27	37	
Total molluscs			**28**	**29**	**48**	**46**	**64**	**95**	**114**	
Others			3	10	6	10	14	19	20	
Total area			**865**	**1277**	**1579**	**1720**	**1648**	**1785**	**1647**	

Source: 1970-87: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.
1988: Provisional FISHDAB.

Note: The main fishing countries are listed in ranking order by catch size

a/ Species and area totals have been revised to take account of the revision of the boundary between areas 77 and 87, the latter area now including Ecuador and Colombia, the catches of which were previously entirely included in the former.

b/ Potential varies - USA fishery collapsed in the 1950s

Table 16

Southwest Pacific (Area 81)

Stock	Main fishing countries (1988)	Estimated potential ('000 t)[a/]	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Demersal	New Zealand, Australia, Japan	appr. 500	60	90	196	195	176	167	164	Moderately to heavily exploited in some areas
Poutassou	New Zealand, USSR	Not available	23	19	17	8	17	16	21	Unknown
Hoki (Grenadier)	New Zealand, USSR, Japan		7	49	38	43	187	194	257	
Small pelagic	USSR, Australia, Japan	appr. 1000	12	25	21	40	126	127	79	Probably mostly exploited
Jack mackerels	New Zealand, Japan	Not available	14	13	17	22	28	31	37	Unknown
Rock lobsters	New Zealand	6	5	4	5	6	5	5	3	over-exploited
Oysters	Australia, New Zealand	b/	19	20	18	17	15	13	17	Probably fully exploited
Cephalopods	Japan, New Zealand, Korea Rep. USSR	Not available	8	37	116	123	101	112	103	Lightly exploited
Total area			**247**	**373**	**549**	**578**	**755**	**907**	**908**	

Source: 1970-87: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.
1988: Provisional FISHDAB.

Note: The main fishing countries are listed in ranking order by catch size

a/ Main Australian fishery in Tasmania/South Australia now considered under Indian Ocean

b/ Potential harvest dependent on intensity of aquaculture

Table 17

Southeast Pacific (Area 87)

Stock	Main fishing countries (1988)	Estimated potential ('000 t)	Catches ('000 t)a/ 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Chilean hake	Peru, Chile, Cuba	100-200	139	194	85	47	74	64	150	Fully exploited
Chilean jack mackerel	Chile, USSR, Peru, Cuba	over 2000(?)	173	776	1845	2148	1961	2682	3246	Moderately exploited
Patagonian hake	Chile		0	9	37	32	39	57	69	
Patagonian grenadier	Chile		0	3	22	19	37	132	212	
South Pacific breams	Peru, Chile		16	18	20	20	41	48	30	
South American pilchard (=sardine)	Peru, Chile	3000(?)	103	1512	3743	5814	4333	4686	4998	Fully to heavily exploited
Chilean herring	Chile, Cuba		131	31	35	38	38	32	30	
Anchoveta (=Peruvian anchovy)	Peru, Chile	2-5000b/	6959	2251	884	987	4945	2101	3613	Fully to heavily exploited
Eastern Pacific Bonito	Peru		51	7	18	10	5	19	35	
Chub mackerel	Ecuador, Chile, Peru	Few 100s	103	527	412	201	149	174	203	Moderately exploited
Squids	Chile, Peru	Some 100s	0.6	0.6	2.1	19.5	5.9	4.8	7.2	Virtually unexploited
Total area			**8038**	**5731**	**7780**	**10728**	**13001**	**10970**	**13654**	

Source: 1970-87: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.
1988: Provisional FISHDAB.

Note: The main fishing countries are listed in ranking order by catch size

a/ Species and area totals have been revised to take account of the revision of the boundary between areas 77 and 87, the latter area now including Ecuador and Colombia, the catches of which were previously entirely included in the former.

b/ Potential used to be 9 000-11 000 tons under conditions occurring before the collapse in the 1960s. The new potential is more likely in the order of 2 to 5 million tons but the stock is highly variable

Table 18

Southern Oceans (Areas 48, 58 and 88)

Stock	Main fishing countries (1988)	Catches ('000 t) a/ 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Notothenia Rossii									
Area 48 b/	USSR	83	7	11	2	0	0	0	Over-exploited
Area 58 c/	USSR	47	13	5	2	1	0	0	Over-exploited
Notothenia squamifrons									
Area 48 b/	USSR	0	1	0	1	0	0	2	Unknown
Area 58 c/	USSR	22	11	7	7	2	3	5	Heavily exploited
Patagonotothen brevicauda									
Area 48 b/	USSR	0	3	18	12	16	9	13	Unknown
Notothenia gibberifrons									
Area 48 b/	USSR	0	8	7	8	2	3	10	Heavily exploited
Champsocephalus gunnari									
Area 48 b/	USSR,	3	62	63	16	14	71	36	Heavily exploited
Area 58 c/	USSR, France	24	28	10	8	17	4	2	Heavily exploited
Other fishes									
Area 48 b/	USSR, Poland	1	16	17	8	4	5	19	
Area 58 c/	USSR	3	1	1	8	1	3	1	
Area 88	Poland	0	0	1	0	0	0	0	

Table 18 (continued)

Stock	Main fishing countries (1988)	Catches ('000 t) a/ 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Total fishes									
Area 48		**87**	**97**	**116**	**47**	**36**	**88**	**80**	
Area 58		**96**	**53**	**23**	**25**	**21**	**10**	**8**	
Area 88		**0**	**0**	**1**	**0**	**0**	**0**	**0**	
Krill									
Area 48	USSR, Japan, Chile, Poland	5	93	253	181	426	346	363	Probably under-exploited
Area 58	USSR	0	27	104	6	16	29	7	
Area 88	Japan	0	1	5	5	4	0	0	
Total area									
Area 48		**92**	**190**	**369**	**228**	**462**	**434**	**443**	
Area 58		**96**	**80**	**127**	**31**	**37**	**39**	**15**	
Area 88		**0**	**1**	**6**	**5**	**4**	**0**	**0**	
Total Southern Oceans		**188**	**271**	**502**	**264**	**503**	**473**	**458**	

Source: 1970-87: Yearbooks of Fishery Statistics (Catches and landings) FAO, Rome.
1988: Provisional FISHDAB.

Note: The main fishing countries are listed in ranking order by catch size

a/ Split year fishing season: July 1 to June 30; split-year data shown under the calender year in which the split-year ends.

b/ Principally around South Georgia.

c/ Principally around Kerguelen.

Table 19

Oceanic tunas and billfishes

Ocean	Species	Main fishing countries (1988)	Estimated potential ('000 t)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Atlantic	N. Bluefin	France, Spain, Italy, Yugoslavia		16	23	22	26	21	19	22	West: over-expl. East: heavy
	Albacore	Spain, Taiwan (P.China)	North:50-70 ? South:27-31	78	72	64	75	75	65	65	Heavy
	Yellowfin	Spain, France, Venezuela, USA	East:117-129 West: ?	86	124	142	148	130	136	120	East: moderate West: uncertain
	Bigeye	Japan, Spain, France, Corea Rep., Portugal	66-74	51	53	66	77	60	48	54	Moderate
	Skipjack	Spain, Ghana, Brasil, France, Portugal		75	85	131	114	114	116	155	East: underexpl. West: uncertain
	Billfish and swordfish	Spain, Italy, USA, Algeria, Japan		21	21	29	46	41	43	49	Blue & white marlin: heavy Sailfish, East: underexploited Sailfish, West: moderate
Total principal tunas, billfishes and swordfish		Atlantic Ocean		327	378	454	486	441	427	465	
Small tunas and seerfishes		Turkey, Mexico, Ghana Senegal		88	86	121	93	85	103	118	
Total Atlantic Ocean Tuna				**415**	**464**	**575**	**579**	**526**	**530**	**583**	

Table 19 (continued)

Ocean	Species	Main fishing countries (1988)	Estimated potential ('000 t)	Catches ('000 t) 1970–74	1975–79	1980–84	1985	1986	1987	1988	State of exploitation
Indian	S. Bluefin [b/]	Australia, Japan		50	38	43	35	27	26	21	Overexploited
	Albacore	Taiwan (P.China)	19–25?	11	11	16	10	26	25	29	Heavy
	Yellowfin	France, Spain, Oman		30	38	55	101	116	129	182	West:Heavy East:Moderate
	Bigeye	Korea Rep., Taiwan (P.China), Japan	40–56?	16	33	37	43	43	48	50	Heavy but stock healthy
	Skipjack	Maldives, Spain, France, Sri Lanka		38	34	63	138	148	162	195	Moderate
	Billfishes and swordfish	Sri Lanka, Japan, Korea Rep., Taiwan (P.China)		6	7	10	17	17	15	14	Swordfish unexpl.?
Total principal tunas, billfishes and swordfish		Indian Ocean		151	161	224	344	377	405	491	
Small tunas and seerfishes		India, Sri Lanka, Pakistan, UAE, Yemen Dem., Iran		56	86	140	212	214	250	278	
Total Indian Ocean Tuna				**207**	**247**	**364**	**556**	**591**	**655**	**769**	

Table 19 (continued)

Ocean	Species	Main fishing countries (1988)	Estimated potential ('000 t)	Catches ('000 t) 1970 -74	1975 -79	1980 -84	1985	1986	1987	1988	State of exploitation
Pacific	N. Bluefin	Japan		20	19	19	11	14	12	6	Uncertain
	Albacore	Japan, Taiwan (P.China), USA, Korea Rep.	North ? South: over 35	121	118	104	92	85	79	76	Heavy
	Yellowfin	USA, Mexico, Japan, Philippines, Venezuela	East: 160 (average) Center and West ?	300	390	400	482	549	613	561	East:Fully Center & West: probably sustainable
	Bigeye	Japan, Korea Rep.		83	125	111	124	150	150	109	Fully
	Skipjack	Japan, USA, Indonesia, Philippines, Korea Rep.	3000	395	506	666	656	805	739	892	Moderate
	Billfishes and swordfish	Japan, Taiwan (P. China)		59	60	62	57	66	73	72	Swordfish: Moderate
Total principal tunas, billfishes and swordfish		Pacific Ocean		978	1278	1362	1422	1669	1666	1716	
Small tunas and seerfishes		Indonesia, Philippines, Japan, Thailand, Korea Rep.		340	369	532	627	644	688	741	
Total Pacific Ocean Tuna				**1318**	**1647**	**1894**	**2049**	**2313**	**2354**	**2457**	
Total all oceans principal tunas, billfishes and swordfish				1456	1817	2040	2252	2487	2498	2672	
Total all oceans small tunas and seerfishes				484	541	793	932	943	1041	1137	
Total all tunas and tuna-like fishes				1940	2358	2833	3184	3430	3539	3809	

Source: 1970-87: Yearbooks of Fishery Statistics (Catches & landing) FAO, Rome.
1988: Provisional FISHDAB.

Note: The main fishing countries are listed in ranking order by catch size

a/ Depends on strength of recruitment, which appears highly variable

b/ Includes S. Bluefin caught in the Pacific and Atlantic

Table 20

Inland (freshwater and diadromous) fisheries production by aquaculture, capture fisheries and total fisheries by continent from 1984 to 1988

	Catch ('000 t)				
	1984	1985	1986	1987	1988
AQUACULTURE					
Africa	34	58	59	61	68
America N.	182	185	214	235	231
America S.	12	13	13	16	18
Asia	3 288	2 896	4 492	5 151	5 614
Europe	279	285	293	313	332
Oceania	1	1	1	2	2
USSR	267	289	320	345	359
TOTAL	4 063	4 727	5 392	6 123	6 624
CAPTURE FISHERIES					
Africa	1 491	1 473	1 597	1 662	1 756
America N.	213	217	212	280	256
America S.	317	305	338	360	329
Asia	2 630	2 645	2 838	2 844	2 979
Europe	130	137	157	124	130
Oceania	15	15	14	14	15
USSR	575	571	561	605	587
TOTAL	5 371	5 363	5 717	5 889	6 052
TOTAL FISHERIES					
Africa	1 525	1 531	1 656	1 723	1 824
America N.	395	402	426	515	487
America S.	329	318	351	376	347
Asia	5 918	6 541	7 330	7 995	8 593
Europe	409	422	450	437	462
Oceania	16	16	15	16	17
USSR	842	860	881	950	946
TOTAL	9 434	10 090	11 109	12 012	12 676

SOURCE: Aquaculture 1984-88: FAO Fishery Circular No.815, Rev. 1 and 2

Total fisheries 1984-88: FISHDAB, Fishery Statistical Database FIDI

Capture fisheries 1984-88: Obtained by difference between total fisheries & aquaculture

NOTE: Aquaculture includes small quantities of fish caught in the zone which, although classified as marine, belongs to brackish waters.

Table 21

Aquaculture Production by Environment and Groups of Species, 1984-88

	1984	1985	1986	1987	1988	% Change 1988/84
	Tonnes					
FINFISHES	4331884	5047065	5744308	6546961	7114597	64.24
Inland	3751676	4411040	5056328	5750404	6243290	66.41
Brackish	324011	331215	353436	389950	397722	22.75
Marine	256197	304810	334544	406607	473585	84.85
CRUSTACEANS	227955	276506	389090	589067	608438	166.91
Inland	33236	34603	52433	62539	52086	56.72
Brackish	179113	221329	308209	492244	517291	188.81
Marine	15606	20574	28448	34284	39061	150.29
MOLLUSCS	2042912	2229953	2441298	2668413	3076967	50.62
Inland	9087	9783	10465	9471	14547	60.09
Brackish	80214	84186	82439	90526	103003	28.41
Marine	1953611	2135984	2348394	2568416	2959417	51.48
MISC.AQ.ANIMALS	21511	28224	30416	27702	34023	58.17
Inland	769	760	814	839	878	14.17
Brackish	0	30	50	148	414	.
Marine	20742	27434	29552	26715	32731	57.80
GRAND TOTAL	6624262	7581748	8605112	9832143	10834025	63.55
Inland	3794768	4456186	5120040	5823253	6310801	66.30
Brackish	583338	636760	744134	972868	1018430	74.59
Marine	2246156	2488802	2740938	3036022	3504794	56.04
AQUATIC PLANTS	3445752	3484188	3500051	3155657	3632281	5.41
Inland	20	266	22	13	23	15.00
Brackish	10036	9972	9208	5479	6576	-34.48
Marine	3435696	3473950	3490821	3150165	3625682	5.53

Table 21 (continued)

Production by Environment and Species

	1984	1985	1986	1987	1988	% Change 1988/84
			Tonnes			
INLAND WATERS						
Cyprinids	2356755	2948074	3551546	4149847	4589052	94.72
Cichlids	140271	180035	193847	211423	229140	63.4
Misc.freshw.fishes	887778	959914	999287	1043849	1056397	18.99
Sturgeons	150	150	180	165	205	36.67
Eels	77025	79372	76716	87287	98961	28.48
Salmonoids	197095	196167	205510	227960	238169	20.84
Misc.diadr.fishes	90336	44572	26680	27269	28796	31.88
Redfishes and bass	281	817	836	162	162	-42.35
Mullets	1969	1923	1715	2431	2397	21.74
Misc.marine fishes	16	16	11	11	11	-31.25
TOTAL FISHFISH	3751676	4411040	5056328	5750404	6243290	66.41
Freshw.crustaceans	33184	34536	52325	62366	51648	55.64
Crabs	1	1	1	1	1	-
Shrimps, prawns	51	66	107	172	437	756.86
TOTAL CRUSTACEANS	33236	34603	52433	62539	52086	56.72
Freshwater molluscs	586	615	702	1232	2130	263.48
Oysters	1	8	8	8	8	700.00
Mussels	0	0	0	0	3107	
Clams	8381	9045	9641	8143	9144	9.10
Misc.marine molluscs	119	115	114	88	158	32.77
TOTAL MOLLUSCS	9087	9783	10465	9471	14547	60.09
Frogs	0	4	15	20	20	
Turtles	688	680	731	779	795	15.55
Misc.aquat.invertb.	75	72	66	38	61	-18.67
Pearls	6	4	2	2	2	-66.67
TOTAL AQUATIC ANIMALS	769	760	814	839	878	14.17
GRAND TOTAL	3794768	4456186	5120040	5823253	6310801	66.30
Misc.aquatic plants	20	266	22	13	23	15.00
TOTAL AQ.PLANTS	20	266	22	13	23	15.00

Table 21 (continued)

Production by Environment and Species

	1984	1985	1986	1987	1988	% Change 1988/84
			Tonnes			
BRACKISH WATERS						
Cichlids	31734	32185	19287	42166	35367	11.45
Misc.freshw.fishes	11267	11198	24982	15824	15283	35.64
Eels	44	52	48	49	19	-56.82
Salmonoids	5381	6647	7140	8784	12749	136.93
Misc.diadr.fishes	264872	269210	286628	308874	320228	20.90
Redfishes and bass	888	1531	1876	2673	3295	271.06
Mullets	8049	8132	10793	9578	9594	19.19
Herrings	0	3	3	3	3	
Misc.marine fishes	1776	2257	2679	1999	1184	-33.33
TOTAL FINFISH	324011	331215	353436	389950	397722	22.75
Freshw.crustaceans	5000	5000	6000	8601	8001	60.02
Crabs	2780	3012	3470	3068	3020	8.63
Lobsters	3	6	2	5	25	733.33
Shrimps, prawns	150225	189206	272802	451549	475228	216.34
Misc.mar.crustac.	21105	24105	25935	29021	31017	46.97
TOTAL CRUSTACEANS	179113	221329	308209	492244	517291	188.81
Abalones	144	253	502	1072	1157	703.47
Oysters	47507	48664	48030	58152	60039	26.38
Mussels	23099	25120	25112	25022	25216	9.16
Clams	9464	10149	8795	6280	16591	75.31
TOTAL MOLLUSCS	80214	84186	82439	90526	103003	28.41
Turtles	0	30	50	50	50	.
Misc.aq.invertb.	0	0	0	98	364	.
TOTAL AQ.ANIMALS	0	30	50	148	414	.
GRAND TOTAL	583338	636760	744134	972868	1018430	74.59
Red Seaweeds	10031	9972	9206	5427	6558	-34.62
Misc.aq.plants	5	0	2	52	18	260.00
TOTAL AQUATIC PLANTS	10036	9972	9208	5479	6576	-34.48

Table 21 (continued)

Production by Environment and Species

	1984	1985	1986	1987	1988	% Change 1988/84
	Tonnes					
MARINE WATERS						
Cyprinids	287	227	66	149	26	-90.94
Cichlids	0	0	0	18	28	
Eels	15	20	31	56	100	566.67
Salmonoids	58565	97877	118734	161763	208315	255.70
Misc.diadr.fishes	285	236	308	253	274	-94.80
Flatfishes	878	1667	1965	2427	3280	273.58
Cods	0	0	0	5	7	
Redfishes and bass	27971	30843	36987	42462	50338	79.96
Mullets	157409	158359	154755	167425	175129	11.26
Tunas	50	38	319	99	47	-6
Misc.marine fishes	10737	15543	21379	31950	36041	235.67
TOTAL FINFISH	256197	304810	334544	406607	473585	184.85
Freshw. crustaceans	5	15	4	6	1	-80.00
Crabs	255	213	211	382	282	10.59
Lobsters	14	16	11	57	65	364.29
Shrimps, prawns	12570	18313	25661	31032	35789	184.72
Misc.marine crust.	2762	2017	2561	2807	2924	5.86
TOTAL CRUSTACEANS	15606	20574	28448	34284	39061	150.29
Abalones	17	29	300	381	441	2494.12
Oysters	810955	858677	875833	912226	937108	15.56
Mussels	660645	712018	754814	869519	1001031	51.52
Scallops	78588	122321	164274	196969	305529	288.77
Clams	296814	328068	420239	429094	430857	45.16
Misc.marine molluscs	106592	114871	132934	160227	284451	166.86
TOTAL MOLLUSCS	1953611	2135984	2348394	2568416	2959417	51.48
Sea squirts	20560	27235	29348	26509	32519	58.17
Misc.Aquatic Invertb.	0	0	0	0	2	
Pearls	182	199	204	206	210	15.38
TOTAL AQUATIC ANIMALS	20742	27434	29552	26715	32731	15.80
GRAND TOTAL	2246156	2488802	2740938	3036022	3504794	56.03
Brown seaweed	2522923	2560740	2369880	2137424	2366994	-6.18
Red seaweed	686027	654462	727274	639937	843462	22.95
Green seaweed	4734	10658	11040	7588	8670	83.14
Misc.aq.plants	222012	248090	382627	365216	406556	83.12
TOTAL AQ. PLANTS	3435696	3473950	3490821	3150165	3625682	5.52

Source: FISHDAB, Fishery Statistical Database, FIDI

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